TOWARDS A HAPPIER LIFE

A Home Doctor for India

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DEDICATION

TO MY COUNTRYMEN

The greatest delight of Age and Experience is, it is said, to instruct the youth and to come to the aid of the inexperienced. For, have not we heard of sea-men, unless they be pirates, who had discovered rocks in their voyage and had the good fortune to escape from them alive, pointing out their presence to their inexperienced brethren lest these latter should get ship-wrecked against them in their voyage too? Perhaps no human being worth the name will ever withhold from his fellowmen that knowledge which helps them to avoid the perils of life!

The influence which sound knowledge imbibed in early youth together with the proper conduct of life naturally resulting therefrom, produces on the whole course of man's life is undoubtedly great; for, which man or woman did not repent some part of his or her life-time that he or she did not possess at an earlier age that knowledge on which his or her present happiness depended?

And this work is an attempt to furnish that kind of knowledge to our young men and women, which very few acquire until they are old, when, it may be said, the knowledge has come to them too late to be of real service.

THE AUTHOR

REVIEWS OF THE FIRST EDITION OF THIS BOOK

"The path to Freedom from Disease" is the alternative title of this excellent book and Dr. Kamath might readily have substituted "The Principles of Hygiene." He possibly avoided the latter title lest his work would be classed as a text book, which it virtually is—with a difference.

This comprehensive treatise on the all important subject of Hygiene is primarily intended for the layman, and while covering the entire subject, is written in plain simple language and in a manner which is bound to sustain the interest of the reader.

In dealing with the subject the author makes no apology for being dogmatic but drives home the principles and practice of hygiene without the aid of technical details and statistical returns.

This book deserves a wide circulation, and as a work of reference will prove invaluable to all young doctors. (**THE MADRAS MAIL**).

Why are we in India so backward in our physical health and efficiency as compared with people of other nations? Why is India so much "eaten up with poverty, ill health and sickness that thousands die at every visitation of epidemics?" These are some of the many important questions answered by the author in an exceedingly lucid manner. (**THE ILLUSTRATED WEEKLY OF INDIA**).

In this comprehensive work the author has given all the information necessary for the manufacture of good health and the prevention of disease. The book consists of four parts. The first part deals with general sanitation, personal and mental hygiene, marriage, contraception and drug addiction. The second part discusses the important problem of nutrition. The author describes in detail the various articles of food available in India, and shows how a well-balanced diet can be had cheaply. In the third part the causation and prevention of various maladies are dealt with in detail. The fourth part is concerned with "mother-craft". Sound advice and useful hints are given both to the expectant and nursing mother. Besides dealing exhaustively with various aspects of health and disease, attention is also drawn to the relation of the mental and emotional state of physical well-being.

On the whole the book is a mine of useful and up-to-date information on health matters and would go far towards furthering a general health programme aimed at

INTRODUCTION

Why are we so backward in our physical well-being and efficiency as compared with other Nations? Why are we so much eaten up with poverty, ill health and sickness that thousands amidst us die at every visitation of epidemics? Again, while every civilised country in the world has been able to more or less abolish diseases like cholera, plague, small-pox and leprosy, and reduced the mortality from tuberculosis, why are these diseases so well rooted in our Country and rampant amongst us? We may naturally say, our poverty is the cause. Well, if we are cursed with grinding poverty which keeps our millions in semi-starved condition is it not because our economic condition is bad, our agriculture primitive and our ryots are ignorant of scientific methods of cultivation?

If epidemic diseases like cholera, plague, small-pox etc. remain as our permanent guests and carry off thousands every year is it not because we are ignorant of the very elementary laws of hygiene and sanitation?

Now, what are the other Countries of the world doing to improve the health and well-being of their people? We find that the pursuit of health-culture and open-air-life has become a passion, almost a religion in all civilised countries. In fact that was how the open-air-treatment of tuberculosis was started and introduced in all the civilised countries 50 years ago.

Now, what are we doing in this Country to promote national health and efficiency of our people? Prevention is the watchword of this century, and it is our bounden duty to study the sign of the times and march along the path of progress, which Preventive Medicine is beckoning us to follow.

What is our first duty then? Our first duty is to realise the value of health and to regard its preservation as our sacred duty. Now the greatest number of strong and healthy citizens in a nation is its greatest asset, while the greatest number of sick persons, its greatest liability. We should, therefore, realise that if we should

and are unnecessary, being irritants or stimulants and liable to easily establish habit by their use.

Regarding the use of spirituous liqours, it must be said from a medical stand point that their effects on individual health and on that of the progeny have been uniformly disastrous, not to mention the moral degradation and the economic distress their prolonged use brings about. Nations long addicted to alcohol count perhaps the greatest number of idiots or imbeciles among them, or neurotic individuals whose nervous system is so shattered that they can hardly stand the strain of civilisation, the result being either insanity or suicide. In brief, it may be said that "with an alcoholic anything is possible and there is no disease, bodily or mental which alcohol does not predispose to."

With respect to the tobacco habit the effect on the individual or national health and efficiency cannot be better illustrated than by quoting the opinion of a French General, who attributed the defeat of his Nation in the battle of 1870 to the prevalence of the smoking habit among the soldiers.

We are in this Century amidst the hustle and bustle of civilisation—whirling and whirring civilisation of cars and planes—and it is necessary that we cultivate the quality of calm or quiet and restfulness also to ensure a healthy mind in a healthy body; otherwise our body-machinery will break down prematurely and mental equilibrium be disturbed as has been the case in many instances. We, therefore, require a certain number of hours of recreation and sleep. Recreation, it should be noted, is also a form of rest. Growing children and students and businessmen require much more than others. The usual school hours of work should be limited and children should not be allowed to work in the hottest part of the day, as heat also taxes the brain much more than even hard study.

Sedentary life without exercise is not conducive to robust health. Some form of sports and exercise in the open air is necessary for the younger generation and at least a brisk walk for the older. Exercise and sports not only

of all foods, but he would like also to mention eggs and poultry as valuable source of animal protein. More poultry could easily be kept in every village if properly managed, and would cost little to maintain, since the grain they consumed would otherwise to a large extent be wasted, while there was usually an abundance of the insect life which formed an important part of the diet of poultry.

Only by making the greatest possible use of every available source of foods of animal origin, such as milk and eggs which were of high dietetic value, could the diet of the people of India be made a satisfactory one, and the most feasible way of providing such foods seemed to be by mixed farming; but more attention should be paid to subsidiary sources such as fish.

The general poverty of the Indian masses makes it essential to explore every available method which will help to improve the present state of malnutrition. But it should be remembered that diet in India is regulated by custom, tradition and religious sanction, so much so the task of the food-reformer and of the public-health worker is made extremely difficult; efforts should therefore be made to educate the public in dietetics, and the valuable knowledge gained from scientific research in this direction be made available for the welfare of the public. For this purpose, as pointed out above, a concerted effort and co-operation on the part of the public and the Government is necessary.

Recent researches in the Nutritional Institute, Coonoor, have shown that in regard to such an essential article of diet as milk, substitutes such as calcium-lactate may be employed which from the point of view of cost may be well within the means of a very large section of the community, the amount sufficient for a child costing only half-anna per month.

Experiments have also shown that a good supply of Vitamin A, the deficiency of which in the Indian diet is responsible for much ill-health and malnutrition, can be had in red palm-oil derived from the fruit of a West African palm, at one-third of the cost for which it is purchaseable in the form of Cod Liver Oil. A small but successful

odour and palatability are no indications to its suitability and safety for drinking purposes, as most polluted waters may be clear and are palatable; and although filtration through a few feet of soil might remove the disagreeable appearance, colour and smell of most filthy waters, such filtration does not remove its dangerous properties.

The difficulty of obtaining for drinking purposes a wholesome quality and quantity of water is mainly due to the pollution to which water is subjected by certain evil habits of the people, and it is largely owing to this pollution that diseases caused by microbes and parasites are so common in our Country.

In Tropical waters the presence of disease-germs and parasites and their ova or embryos are more common than in the waters of the temperate climates, where conditions for the growth of these are not so favourable.

The drinking of impure and contaminated water in the temperate climates gives rise to diseases, as we have said, like Infantile diarrhoea, Enteric fever and Cholera, but in India the use of a contaminated water gives rise not only to these complaints but also to Dysentery and several parasitic affections like Guinea-worm and Flukes infection. Goitre and Stone in the Bladder are very common in places where the water contains an excess of Calcium salts and salts of Magnesium.

Hard and soft waters. These characters of water will depend upon the geological strata through which it has travelled; a water that has passed through chalky strata usually contains in solution certain alkaline salts. Hence, rain water is the softest, being devoid of any alkaline salts. Spring water and water from wells (shallow or deep) do contain CO_2 and Ca Salts and are therefore hard. The hard waters from springs and deep wells are the safest waters being palatable also; but from an economic aspect hard waters are undesirable, as they deposit a thick crust in boilers and do not produce free lather with soap, thus leading to wastage of soap in their use.

Wells. Shallow wells are those sunk into a superficial porous bed of sand or gravel which overlies an impermeable layer of clay or rock beneath. These wells draw mainly

it comes in contact with organic impurities, which are oxidised by the chlorine and rendered innocuous. It is, thus, a powerful germicide and renders the water treated with it safe for domestic use. The amount of bleaching powder necessary to add to the water depends on the percentage of "available" chlorine. Usually a freshly prepared bleaching powder has about 35% available chlorine, but if kept for some time its availability is often only about 20%. A specimen for use should contain not less than 20%.

Generally speaking, 30 grs. of bleaching powder (of a strength of 25% available chlorine) will be required for 100 gallons of water, or 4 lbs. per 100,000 gallons of water. If the bleaching powder is stronger or weaker than 25% a comparatively smaller or larger amount must be used. Now, to calculate how much bleaching powder is required to chlorinate the water of a well, it must be remembered that a cubic foot of water contains 6¼ gallons. Having found out by actual measurement in feet the depth of water and the diameter of the well it is easy to calculate in cubic feet the total amount of water in the well, and judge of the quantity of bleaching powder required for disinfecting the well.

The required quantity of bleaching powder is put in a bucket, water added and mixed; then the whole is allowed to settle and the supernatent fluid poured into the well. A bucket is then let down on a rope into the well, allowed to sink and then pulled up and down several times to ensure a thorough mixing of the solution.

The water thus treated may be ready for use in about 4 to 6 hours, although a chlorinous smell persists for a day or two.

Chlorogen or Electrolytic Chlorine are ready made fluid preparations of chlorine and are highly useful for disinfecting water, being of a constant composition.

Perchloron and caporit are solids, said to contain about 60% available chlorine.

Potassium Permanganate. Also about 30 grs. per 100 gallons of water is generally required. The necessary amount is dissolved in a bucket of water, which is let

life, which has culminated in the human being. Even the primitive man evidently recognised this fundamental importance of sunlight for his very existence and worshipped the Sun as his God. But with the development of culture and dawn of civilisation he gradually began to retreat from the "light". First, he excluded the sunlight from his body under the impulse of adornment or modesty or protection from heat and cold by clothing it; next, he devised dwellings in which he spent mostly his time shielding himself and his belongings from the Elements but excluding the beneficient rays of the Sun. Thus from the bright daylight of the farm he led himself into the shadows of the factory, and when he built the modern city with its tall edifices, cramped houses and narrow streets he made direct sunshine a comparative stranger; and when finally its atmosphere became polluted with smoke, dust, gasolene fumes and toxic gases from industries and overcrowding, the most vital and energising rays of the Sun were practically shut away from him.

However gloomy this picture be it is not without a brighter aspect; for Science and commonsense have led to a new realisation that both life and health demand a reasonable dose of the all-energising rays of the Sun, and so the new cult of the Sun began with its sunbaths and other means of exposure to the ultra-violet rays. The action of the ultra-violet rays on the skin is at first to produce a superficial redness by influencing its circulation, followed later by the pigmentation of the skin, known as the sunburn. This pigmentation of the skin insures a greater tolerance of the body against heat rays (the thermic rays) of the Sun, reducing thereby the oppressive effect of solar heat and permitting absorption of more ultra-violet rays. The tolerance so produced also does away with the tendency of some people to easily "catch cold" even on the slightest exposure.

The action of ultra-violet rays on the skin may affect the whole body as has been proved by their power to cure rickets. Roller credits sunlight on the skin with favourably influencing the haemoglobin contents of the blood, the internal secretions of the endocrine glands, the diges-

II. General Sanitation

We have seen that environment and character of the houses and localities where people live have much to do with their health and happiness, and that bad dwelling conditions and unclean habits predispose to disease by lowering their general vitality. Unfortunately the sanitary conditions of many of the houses that are now occupied are not capable of improvement, nor is it possible to change the peoples' habits, because once they are formed it is almost impossible to break away from them. The one hope of Sanitary workers lies however in the education of the younger generations in the ways of cleanliness and thrift and in the building of Sanitary dwellings in the future.

The lack of air and light in houses and tenement-buildings, the lack of open-space for children to play out of doors, the dirty and sometimes filthy door-yards and houses of the poor, all these predispose especially the children to ill-health and premature death.

Under the head of General Sanitation come a number of health problems commonly known as "Nuisances." These include the disposal of Refuse and Waste material, the control of Vermin and insects, and a number of miscellaneous items as spitting, air contamination with smoke, dust, obnoxious odours and vapours from the trades and industries etc. Some of these will be discussed under Industrial Hygiene.

1. DISPOSAL OF REFUSE

The general health of a community largely depends upon the efficiency with which all refuse (including animal and human excreta) is collected and disposed of, as all organic refuse matter such as garbage. leaves, vegetables, rotten fruits, kitchen waste, stable litter and street sweepings, horse and cow dung etc., are liable to undergo putrefaction in the presence of warmth and moisture, and give off offensive smell, or serve as breeding places for flies,

under favourable conditions the nitrifying process will be complete in about 90 days; so that after this period if the trench should be opened up there will be left no trace of fæcal matter and that instead it has all been converted into a soil of high manurial value fit for cultivation purposes, and perfectly free from smell or germs of disease or ova of intestinal worms.

Incineration is a useful mode of disposal of night soil in a rapid manner and is a method commonly adopted by municipalities where trenching is not convenient.

3. DISPOSAL OF SLOP WATER

The removal and efficient disposal of domestic and other water of towns and villages is a very difficult sanitary problem, for these are no less impure than the ordinary sewage of water-closet towns. The slop water from isolated villages is usually conveyed by pervious drains, which are mostly shallow open trenches, to the nearest tanks, garden or open land. Often there is no proper slope to permit the water to pass with sufficient velocity to carry solid filth and prevent its deposition. As a result these drains form suitable breeding places for mosquitoes and flies; and the sewage may often soak into the ground and pollute the neighbouring fresh water supply and during the rains form dirty offensive puddles. Often weeds or plants growing in such drains materially impede the free flow of the sewage.

To remove these difficulties it is advised to have the drains constructed with brick and mortar or any non-absorbent material; they are made preferably "V" shaped (on section) with proper inclination, so that even a small amount of water will suffice to flush them and minimise the amount of water standing in them. The sewage can best be disposed of by irrigation over agricultural lands or open fields, while the slop water of individual houses may be collected in suitable pits or tubs and then removed to some cultivated land or to sea for final disposal.

4. DISPOSAL OF SEWAGE

Waste water consisting of liquid and solid human excreta from the wash-down type of closets together with

After allowing a used pit to ripen for 6 months it may be bored out again for use as a latrine and the dug-out material be utilised as a valuable manure.

The bore-hole latrine is an ideal latrine, if only properly used. The user should sit correctly over the hole provided for the purpose and not use the vicinity and entrance passages and the compartments themselves except in the proper manner. With an average use a bore-hole latrine will serve a family of 6 members for a period of 2 years.

Bore-hole latrines should at least be 20 to 25 feet from the nearest drinking water source. If at any time a bore-hole latrine should cause nuisance by smell or flies a small quantity of lime or used up waste engine-oil dropped into the bore-hole will be sufficient to control the nuisance.

child than all precept and advice.

Active participation is the other factor in habit-formation. If the individual can be convinced of the benefits of cleanliness and induced to apply them thoughtfully and sufficiently often, then habit will be established, and once established it becomes his second nature and will be a valuable guide all through his life in protection from disease.

Bathing. Throughout history and in most religions bathing has had a place as a sacred rite. Oriental religions particularly of the warm climates have incorporated bathing in their religious ceremonies.

Rome was noted for her gorgeous baths conducted in a manner that became an impossible luxury. The practice of bathing declined, they say, among the early Xians, because purification of the body was considered to be detrimental to the development of the soul. The revival of the popularity of the bath came through the discovery of the Court-beauties that cleanliness and beauty seemed to have a causal relation. The invention of soap led to much experimentation with all kinds of devices and materials to aid in cleanliness.

Baths cleanse the body by removing from the surface of the skin the dead epithelial cells and the dissolved solids left from sebaceous and sweat glands and any dirt adherent thereto. Friction of the clothing may remove some of this material, but dissolving it in water or soap water is the only effective method. Proper baths serve to keep the ducts of the skin glands open, so that the skin may function freely and to remove any unpleasant odours from the body.

The circulation through the skin is stimulated by hot baths; cold baths in health are a distinct stimulant and tonic to the nervous system. The best time for bath is early morning and the water must be of proper temperature as judged by its reactions on the individual. Properly applied baths do greatly improve the appetite, the digestion and elimination. A warm bath after the day's work is a good sedative.

Heat applied to the skin by baths, hot water bottles

activities have been made available, which produce satisfactory use of the body muscles, such as swimming, tennis, horse riding, hunting, fishing, gardening etc. Exercise taken from this group will be satisfactory for the average person, though every one would be better off if some personal variation were made to suit his own needs.

After 40 years of age activities undertaken should only require moderate endurance and speed. The perils of middle age are a premature deterioration of muscle-power with a lowering of the functional efficiency of the important organs and systems. This can be avoided by a carefully selected regimen of exercise, either from the above named groups on a reduced scale or in a form best suited to the individual's health. No exercise, whether physical or mental, should be carried to the stage of exhaustion.

The lighter skeletal frame work, weaker musculature, smaller heart, smaller lungs and shorter stature of women are sound reasons for adopting standards of performance in keeping with them. Types of activity should be prescribed suited to the needs and in harmony with the powers and functions of the female.

In this connection it must be said, that though in recent years the athletic girl has progressed so far and so fast that some people with more enthusiasm than judgment predicted a time when girls will compete on equal terms with boys, this can never be for reasons just mentioned.

3. PHYSICAL EDUCATION IN SCHOOLS

If the purpose of education is, as it ought to be, to draw the best out of the human personality, the training that is given should take into consideration the close interdependence of the body and the mind. Physical development alone without intellectual acumen is of no great value in life. On the other hand, it should not be forgotten that the mind being rooted in the body can grow and bear fruit only if the body is healthy, strong and adapted to its environment. A balanced growth of mind and body should therefore be the objective of all education. For

attractive environment being a few of the means with which rest can be secured.

Physical rest of the voluntary muscles of the body is not only essential to remove muscular fatigue and restore the working efficiency, but influences directly or indirectly all the organs of the body; and employees have found that periodic rest-periods in many industrial processes result in increased production.

Disturbing noises, repulsive odours, intense light, excessive heat or cold are examples of stress placed on the nervous system through the senses and contribute to the sum-total of fatigue, and demand rest. Practically all these sensations can be favourably modified by the individual by intelligent care. Beneficial results of such care extend to all the systems of the body. Eye strain can be reduced or removed by attention to proper illumination and correct habits of using the eyes with suitable periods of rest; the person whose sleep is not refreshing can frequently be helped by attention to light and noise conditions in his sleeping place.

The sources of mental rest may be found in a combination of interesting work, pleasing exercise, happy play, peaceful sleep, balanced nutrition and effective excretion. Most people are immensely benefited by practising the technic of mental as well as physical (muscular) relaxation. Improvement of the power of repose or tranquillity by proper direction is not impossible.

Benefits of the quality of cheerfulness are a very useful source of mental rest, and interesting work or play are invaluable sources of mental rest.

Some of the signs of imperfect mental rest are constant movements of the limbs, exaggeration of unimportant details of life, groundless fears, anxiety, worry and constant mental excitement. Early recognition of these signs and the securing of proper mental rest may prove an adequate preventive against complete mental disability.

"Sleep" (Tired Nature's sweet restorer, balmy sleep) is a provision imposed by Nature to satisfy the living body's requirement for rest; it is the most perfect form of rest in which the receptivity and the reactivity of the

purpose of clothing adds to sexual attractiveness, stimulates sexual interest and arouses the envy of rivals of the same sex.

The protective purposes of clothing are commonly considered the most important. Originally they were secondary to adornment and modesty. Accidentally, their advantages in protecting the body against cold give them a prominent place. This seems more rational and so we often find the motives of modesty and decoration hiding behind the more utilitarian motive of protection.

Under modern conditions the protection of the body against cold and direct rays of the sun is among the most important protective functions of clothing, such as guarding the body against external enemies, whether by armour or through protection against insects and animals.

From the hygienist's point of view the protective function of clothing ranks first; its physiological usefulness in regulating body temperature, protecting the individual against unfavourable external influences and conserving energy makes clothing an important instrument in the maintenance of health.

Man is a warm-blooded animal; continuance of life requires that the body temperature is maintained within certain critical temperatures. Effective function demands that this range of internal temperature varies only within very narrow limits. The most suitable temperature for maximum activity of the body cells is approximately 98·6 deg. F. Hence both in warm and cold surroundings the body must maintain a uniform temperature, which means an accurate arrangement for heat regulation. This is accomplished by controlling the production of heat in the body or loss of heat from the body or both.

Heat Production. The primary sources of animal heat may be found within or without the body. Heat production occurs wherever metabolism (tissue-activity) takes place, more heat being produced in more active organs and tissues, muscles and glands. Four-fifths of the output of the body-energy is concerned with heat production, 80 p.c. of food eaten is consumed in the cells to make heat; activity of the thyroid, bodily exercise or

It has long been vaguely understood, says Prof. Stephen Leacock, the great American humourist that the condition of a man's clothes has a certain effect upon the health of both body and mind. The well-known proverb "clothes make the man" has its origin in a general recognition of the powerful influence of the habiliments in their reaction upon the wearer. The same truth may be observed in the facts of everyday life. On the one hand we remark the bold carriage and mental vigour of a man attired in a new suit of clothes; on the other hand we note the melancholy features of him who is conscious of a posterior patch or the haunted face of one suffering from internal loss of buttons.

6. PERSONAL CLEANLINESS

Cleanliness of the mouth is of special importance in our Country. Pyorrhoea is a common affection in the tropics and not infrequently results from neglected dental hygiene. The teeth should be thoroughly cleaned with a brush of some sort. Any part of the teeth where the food constantly lodges is likely to decay sooner or later, as this ferments giving rise to acidity, which has a corrosive action on the enamel and dentine of the teeth and leads to dental caries. Hence, it is necessary that scrupulous cleanliness of teeth should be observed. Deposit of tartar should receive attention, and the teeth have to be "scaled", otherwise they will decay and fall. Children's teeth require proper attention also. It will be shown later that the commonest cause of dental caries in children is excessive use of sweets, chocolates etc., which lurking in between the teeth acidify and begin to act on the new dentine and enamel of the teeth.

Washing the hands and feet before saying prayers or before meals has, no doubt, its origin in the hygienic effect of keeping the hands and nails clean. Biting the nails is, of course, an uncleanly habit and particularly dangerous in the tropics, as intestinal infections such as hookworms, round and thread worms, cholera, dysentery are very likely to be carried in this manner.

In the Tropics especially there is a constant danger of

sexual passion and they must be told the need for controlling that passion. This will sooner help them in avoiding the evils of abuse. There is no danger in continence but there is great danger in sexual excess. A certain amount of exercise daily, a non-stimulating diet giving a daily action of the bowels, chastity of thought and avoidance of stimulating literature or pictures will render continence easy and keep the body and mind in a vigorous and healthy condition.

9. CIVILISATION AND HEALTH

Even the primitive man recognised the importance of fresh air, of sunlight and of pure water for his very existence and worshipped the Elements, the Sun and the Rivers as his Gods. At first he lived an itinerant sort of life fixing his temporary abode in open space preferably near rivers and springs, and moved on to a fresher and cleaner spot when the original habitat became too unclean. He thus lived practically in the open air and sunlight with his body bare, and drank pure water; his food was of the simplest kind and fresh and consisted at first of fruits and nuts which Nature yielded, flesh of animals which he hunted, fish and fowl, and latterly of cereals and milk when he learnt the art of cultivation and kept cattle and sheep. He worked hard in the day. This gave him appetite and enabled him to digest his food, build his muscles and vitality, secured him the night's rest, made him immune to the ravages of the elements and to disease. In fact his was a happy life, disease was practically unknown to him and premature death even from child-birth was rare, and he lived to a ripe old age.

But with the advent of civilisation and culture instead of "advancing unto light" he gradually receded from it. At first he excluded light from his body by clothing it, next he built houses in which he spent most of his time shielding himself and his effects from light. Thus, from the broad day light of the farm and the forest he led himself "into the shadows of darkness", and when he built the modern city with its cramped houses, narrow streets and sky scrapers he made

After a variable time the blood-concentration will gradually decrease until the body is practically free from alcohol. Mellanby has calculated that it takes 3 or 4 hours for the body to get rid of one ounce of alcohol and about 10 to 20 hours in the case of a "heavy drink."

Now, it is a matter of common experience that a person *not accustomed* to alcohol is more readily affected than the habitual addict. Schweisheimer showed that if total abstainers, moderate drinkers and heavy drinkers imbibe the same quantity of alcohol under the same conditions of dilution and time with relation to food, the resulting blood-concentration of the alcohol is the highest in the case of abstainers and lowest in the habitual consumers. Habit perhaps explains this difference by producing tolerance for the drug, or maybe some unknown protective power is developed to guard against lethal concentration, evidently by lessening the power of absorption of the stomach mucous membrane, which in an addict shows always signs of chronic inflammation with thickening and consequent atrophy of the digestive glands.

There is a similarity of action between the effect of sugars on the diabetic and the effect of alcohol in the normal individual. The diabetic can dispose of absorbed sugar only through the kidneys, and the normal individual can dispose of his alcohol only by oxidation; but in both cases the mechanism of disposal is effective only to a certain limit of consumption, beyond which increasingly disastrous results do ensue even to the point of death. In either case, therefore, the regulation of the composition of the blood is largely a matter of voluntary control. The diabetic, however, is aware of his danger and exercises his voluntary control over his dietary, but the same thing cannot be said of the alcoholic, as he has no self-control whatever over his drink.

The property of quick oxidation exhibited by alcohol in the system and its capacity to thus spare the tissues of the body from waste are taken advantage of by physicians in the treatment of certain febrile conditions attended with exhaustion and low muttering delirium—toxaemia as of typhoid fever, pneumonia—and alcohol usually pre-

collision with an automobile or in running machinery of any kind. Since alcohol makes it impossible for a person to act quickly it is easily evident that it slows up one's rate of work and might expose an individual to any danger at a time when quick thinking and quick action are necessary.

One can, therefore, imagine that a motorist, for example, under the influence of alcohol is perhaps the greatest menace to public safety, and many of us do still remember some of the worst accidents that happened in Madras a few years ago.

Accuracy is an important factor in many lines of work especially those of a fine order, and experiments have shown that alcoholics were rendered liable to thoughtless or wrong judgments, which seriously interfere with their efficiency as workmen.

Human society has built up through ages certain rules of proper conduct and ethics and ideals of right and wrong, and man has developed a will-power and power of self-restraint. These all form the requisites of a good society. and alcohol by paralysing the nerve-centres in man dulls his power of discrimination between right and wrong; and the effect of long continued habit is a complete breaking down of those refinements which modern civilisation has built up, resulting in moral degradation.

It has been proved beyond doubt that alcohol is not a necessary element for health and that those who take to it do so only for its exhilarating and appetising properties. Small quantities of wine or beer taken with meals may not produce any harm, and if this ration is not exceeded one may be considered, they say, a "moderate drinker." But, the phraseology "moderate" is rather a vague one, as one man's meat may be another man's poison; moreover, there cannot be any definite line of demarkation between "moderation" and "excess," as moderation in the case of habit-forming drugs unconsciously and most certainly leads to excess, and such is especially the case with alcohol.

Man was not born with a craving for drink. It is an acquired taste under the belief that it is a stimulant, but

instrument of "good fellowship."

We have already pointed out how the good fellowship in the beginning leads to bad citizenship in the end; and the formal "good luck and good health" wished each other at socials generally ends in ill luck and ill-health. To such a deadly evil the golden advice applies, "Touch not, taste not, handle not. Truly wine is a mocker, strong drink is raging and whosoever is deceived thereby is not wise." Medical opinion has never been more unanimous in respect of the drink-evil.

The only way to get rid of this enemy is to cut the drink squarely off and to adopt a simple non-meat diet consisting of cereals, nuts, fruits, vegetables, milk etc. It is said that the free use of fruits brings the system back to a new condition of health in which the old appetite can be entirely cast off. Moral strength is, however, required for this purpose and nothing brings it like Prayer and submission to the Divine Will, as He alone can come to the rescue of the fallen victim and no human being can.

Intensive propaganda and advice on temperance and making the teaching of Hygiene and Temperance compulsory in public schools have been tried but have been of little avail in eradicating the evil or even abating it; and public opinion throughout the civilised world now seems to favour the view that some sort of State-interference is necessary, and though the facts discussed above may not be the entire grounds on which the wisdom of "prohibition" by legislation could be based, they nevertheless form an important evidence in its favour. Anti-prohibitionists question the propriety of any legislation in this regard, as, they say, it interferes primarily with the personal liberties of man, as alcohol, they argue, immensely contributes towards "life's pleasures and conviviality." Such pleasures we have seen, are, however, momentary and are bought at very great cost indeed and at the risk of the welfare of the entire nation.

Now that our Country is definitely committed to a policy of prohibition the question arises how best to achieve this end. The experiment of total prohibition had

(1) Nicotine, the active principle. It is an oily substance and is highly poisonous. It is said that a drop of it placed on the tongue of a snake immediately kills it. (2) Prussic or Hydrocyanic acid (oil of bitter almonds). This is admittedly another deadly poison; and (3) Carbonic acid and traces of sulphuretted hydrogen, and yet the drug is named "the fragrant weed."

Tobacco is universally considered dangerous especially to the young as it enfeebles the mind, weakens memory, weakens the heart and lungs; infact, it dwarfs their half-developed organs and in various ways interferes with their normal development. Surely parents and teachers are not awake to the fearful ravages of the cigarette habit amongst their children, else they would put forth greater efforts to warn the little ones against this vice. Dr. Clinton of San Francisco, physician to several Boys' Schools writes:

"A good deal has been said about the evils of cigarette-smoking, but not one-half the truth has ever been told. Cigarette-smoking first blunts the whole moral nature. It has an appalling effect upon the physical system as well. It first stimulates and then stupefies the nerves. It sends boys into consumption. It gives them enlargement of the heart and sends them to the insane asylum. I am often called in to prescribe for boys for palpitation of the heart and in nine cases out of ten this is caused by the cigarette habit. I have seen bright boys turned into dunces and straight forward honest boys made into miserable cowards by cigarette-smoking."

But the evil effects of tobacco are not confined to children alone. They are equally injurious to adults too as is strongly maintained by medical men who have given this matter their special consideration. Excessive smoking gives rise to chronic Pharyngitis with irritability of the throat and cough and might ultimately predispose to Tuberculosis. The blood becomes impoverished and circulation affected; palpitation of the heart and pain over the heart region, being the chief results. Sometimes, though rarely the cardiac pain may be so intense as to simulate angina pectoris. Tobacco-heart (also called

13. DRUG ADDICTION

Even from the earliest days of history mankind appears to have been accustomed to attain degrees of emotional intensity and duration by having recourse to certain narcotics such as alcohol, tobacco etc., not so much for their nutritional value (which in the case of habit-forming drugs is no consideration whatsoever) as for their stimulating and exhilerating effects; and the earliest records available show that Opium, Ganja (Indian hemp) and certain other narcotics like Hemlock (Hyoscyamus) have also long been in constant use among them. Latterly certain drugs like cocaine, chloral hydras and barbituric-acid derivatives (like veronal, medinal, amytal etc.) came to be added to this list.

Addiction to narcotics is seen all over the world, and the first inducement to their use seems to be many and varied. Some take them merely out of curiosity to test their action, others with the object of enjoying their pleasurable effects on the brain; and prolonged use of certain drugs taken as medicine for relief of pain, mental and bodily, has also claimed its victims in some cases. Such patients overcome by the influences of these drugs have in some instances become confirmed addicts.

The drugs used vary in their action. Some are stimulating, others depressing, but each gives to its devotee a certain measure of comfort and pleasure tending slowly and in an inexplicable manner to create in him a craving for it and unconsciously giving rise to habit.

Habitual use of most of them, like opium, alcohol leads to grave moral and physical degradation as the habit once contracted cannot be easily got rid of. Addicts are recognised as persons who, not requiring the continuance of the drug for relief of symptoms of illness, have acquired as a result of repeated administrations an overpowering desire for its continuance. In them the withdrawal of the drug leads to definite symptoms of mental and physical depression or disorder.

The problem of drug addiction in India presents many features, which are widely different from those met with in the Western Countries and America, and as we have

They are extensively employed by the poorer classes and Bairagis on account of their low cost, so much so Chopra estimates the incidence of addiction to this drug in British India ranges between 0·4 to 0·8 p.c. of the population. In Southern India where spontaneous growth of the plant does not occur it is still cultivated for use as a drug of addiction.

The physical effects produced by habitual use of hemp drugs are not so marked or deleterious as those of opium, but they undoubtedly lead to physical, mental and moral degeneration. While under the influence of hemp drugs the addicts appear to lose all power of orientation (idea of correlating time and space) and forget their environments and cannot understand what they are doing; and in certain cases the habit leads to insanity and crime. Ganja and charas are more potent in this respect than bhang. The drug is either smoked alone in *chilm* or with tobacco as beedies, or taken as a drink or panak on ceremonial occasions well rubbed down with milk, poppy seeds, cardamoms, sugarcandy and almonds or cashewnut kernel. In whatever manner used the drug is decidedly harmful; and the popular belief "ಸುಟ್ಟವನು ಕೆಟ್ಟ, ಅರೆದವನು ಮೆರೆದಾ" (He who smokes ganja is ruined, but he that rubs it into a drink will shine with radiant health) is quite unfounded and is only an excuse to start the Ganja habit or keep to it.

Ganja may be used to facilitate committal of an offence like rape or robbery; for this purpose it is used as a drink or a sweet (majum), the latter for its aphrodisiac properties. Highway robbers often give it to their victims as a smoke mixed with Datura. Often times the drug (Ganja) is mixed with potent drugs like opium, datura, aconite and nux vomica by those on whom the simple form of hemp drug has ceased to produce the desired effect of exhileration or stupefaction. When Ganja is smoked or taken internally as a drink or sweet there is a stage of excitement followed by narcotism. They are more immediate in smoking. During the stage of excitement the individual is the subject of hallucinations usually of a pleasurable or sexual character. He may be constantly

are only normal, that they are transcient in nature and they will gradually pass off if they should be a little tolerant.

(5) *Physical Illness*—This is often conducive to emotional disturbances, which are due to the tendency of the patient to fix his attention upon himself and his ailment. Such emotional conditions are combated by explaining these facts to him and by using all available means, such as occupational therapy and other interest-stimulating activities to hasten recovery and to prevent fixation of his attention on his own difficulties. People should be taught to look on illness as a normal incident of life, which must be handled wisely from both the physical and mental stand points.

Habits. An important part of any mental-hygiene-programme consists of the training of the individual to employ wise habits of living, thinking and feeling, for, these constitute an automatic protection against abnormal modes of life.

A budget of life-activities in terms of how each day will be spent is a necessity for modern man. Every individual should regulate his life so that he will have a proper proportion of work, rest, exercise and play every day. If one of these is left out it means interference in the harmony of life. As a result human beings who do not budget their lives wisely in terms of their daily activities are apt to discover that, sooner or later, they must pay the price of their carelessness in terms of ill-health. People who do not work are seldom happy, and are, practically without exception, greater "potential neurotic risks" than individuals who are employed. Occupation, preferably with a purpose, is one of the best known safeguards against mental instability.

Rest is likewise a necessity. The amount must be regulated to the needs of the individual. As a rule one needs to rest 8 hours out of 24, and most people would profit by having say 9 hours. Similarly it has been found that where individuals are under considerable emotional strain in their work it is advantageous for them to have a rest of half to one hour in the day or in the evening

for. This leads to their avoiding theatres and crowds, often public places in general, and as they cut down first on one and then another of their normal activities they become definitely "phobic" and are unable to carry on their normal lives. If the conditioned emotional response were more generally understood with the recognition of the fact there is no need to avoid the situation which gave rise to them, people would be less frightened by these reactions, they would be better able to handle them by virtue of their knowledge, and they would be less apt to acquire the phobic type of neurosis.

The "reconditioning" of the conditioned emotional response is fortunately possible. Such a reconditioning process is not only an important part of child-training but is useful in the treatment of many forms of neuroses in adults. It consists in introducing a pleasant factor in what has been an uncomfortable situation, by the practice of acceptance and tolerance with a reasonable expectation that the undesirable and unwanted reaction will change to a more desirable and comfortable state. For example, the child who had been conditioned to fear by the stimulus of dogs or any type of fur was gradually reconditioned through a process of rewards and pleasures associated with animals and fur to where these objects no longer gave rise to this feeling within him, and similarly a man who had been frightened as a child while sailing in a boat and was thereafter afraid of both boats and bodies of water, was reconditioned by arousing his competitive tendencies: first by having him sail a boat in races until the fact of his being in a boat no longer aroused his fear automatically; and second, by teaching him to find pleasure in competitive diving until he no longer felt any fear in regard to water.

The training which a person receives in his youth plays a very important part in mental hygiene; and many emotional reactions are acquired through contagion. Children who are associated with pugnacious parents are themselves apt to be pugnacious, and children who are associated with apprehensive parents are similarly likely to be timid and easily alarmed. A careful and thoughtful

Children should be taught not to look on death as a horrible ending to their lives but instead to view it as another adventure. In regard to a life after death people should feel that if there be a life hereafter, all that has gone before in their lives is merely a preparation for it, preparing them to meet their friends and loved ones and the great spirits of history who have gone before them. If there be no life hereafter, death can mean only sleep, and what can be more delightful than complete rest?

Likewise, people must understand that death is not an agonising experience. The physicians of the world testify that death in itself is not unpleasant; even though in some few instances the patient seems to be suffering, the time quickly comes if one is in pain, when the higher sensibilities are so benumbed that one is no longer aware of pain or discomfort.

Suicide is a contingency which most people consider at some time in their lives, and the sooner a person can settle this matter for once and for all, the better it is for him. It is impossible for any one to make a satisfactory adjustment to this world, if he is always considering how he may escape from life, if it becomes too difficult. "Escape" from life is always indicative of mental weakness, and suicide is in theory the best of all "escapes" which, however, no one can be sure, is an escape in fact.

Suicide is a cowardly act and an unkind act. It brings more suffering to other people than any thing else a person could do. It retards civilisation by setting a bad example and is a blow to the self-respect and confidence of every other human being in the world with whom that person has been associated. It is, therefore, a cruel, cowardly, selfish and stupid performance. To attempt to commit suicide is criminal, and the majority of people who commit suicide are mentally ill. Once and for all every human being should close this "door of escape."

* * * * *

Mental Hygiene in general has opportunities for application in many fields such as Education, law, sociology etc., and is particularly of value in preventing many

acting at relatively low temperature, but they are extremely active so much so, it is said that the amylase of the Pancreatic juice is capable of converting about four million times its own weight of starch into sugar. The energy contents, however, of the food materials, rather of the food constituents are not in any way interfered with by the action of the Enzymes].

Having studied the functions of the various food-constituents we are now in a position to classify them on what is known as the Physiological basis—as follows:

(1) Tissue-formers—Proteins, mineral salts and water.

(2) Heat and Energy producers—Proteins (to a minor extent) fats and carbohydrates.

(3) Protective Foods or Regulators of the various body-processes—Vitamins and mineral salts.

In the above classification, it will be noted that Proteins appear under two heads out of the three, and we have seen that proteins are essential for the production of the hormones and the enzymes also. Proteins are, thus, of immense importance in diet and justify their title "pre-eminent" which the word, 'protein' signifies. In fact, without protein life is impossible, for the daily wear and tear have to be made good by them alone.

A diet may be predominantly protein and yet life can be healthily maintained thereon for a practically indefinite period as has been proved by the experience of the Eskimo, the Masai and the Red Indians of the Pampas. Omit the protein from the diet and the body cannot last for more than a few weeks.

For generations proteins, fats, carbohydrates, minerals and water, which we saw, are essential for their tissue-forming value and production of heat and energy, formed the fundamental axiom of a proper ration until about thirty years ago, when, however, additional evidence could be adduced to show that these five proximate principles by themselves were inadequate and that a "mysterious something" more was equally essential. This "mysterious something" are the Vitamins already referred to under the classification of the Food Consti-

activity and activity of the organs and glandular structures. Hence they form the chief fuel, as we have already seen, for the body-machinery. They have a leading place among the solid ingredients of diet, as the amount normally present in the body is very scant.

Now, carbohydrates, it will be seen, form the main elements in the diet of practically all nations of the world except those living in the Arctic regions, in whose diet fats do normally preponderate from climatic necessity; moreover, vegetable life, which is the main source of carbohydrates, is scarce or even impossible in these cold regions.

Carbohydrates are mainly classed as the *sugars* and the *starches*. Simple sugars are among the standard substances which the body tissues can use, and as most of them are freely soluble in water and of simple chemical composition they are readily absorbed. Thus, (1) *glucose* (or dextrose) found in fruits especially grapes and in animal-blood, and also (2) *Fructose* (or levulose) found with glucose also in fruits, are most easily and most completely absorbed in the tissues and do not require previous digestion as in the case of starches. Also (3) *sucrose* obtained from sugarcane, beetroot, palmyra, datepalm and some varieties of dahlia-bulbs, and (4) *lactose* (milk-sugar) from milk and (5) *maltose* (malt-sugar) from malt are examples of simple sugars capable of direct absorption from the food more or less in their natural state, that is as they exist in the food-stuffs. In fact in extreme collapse from exhaustion, choleraic diarrhoea, loss of blood as after delivery, pure glucose in solution can be injected directly into the blood-stream and is the only foodstuff with the exception of sodium chloride that can be so injected. At present there are so many preparations of glucose in the market, the most easily soluble being Dextrosol. About 1|2 oz. of Dextrosol in about 4 oz. of water duly sterilised by boiling can be safely injected into the bloodstream.

Fresh fruits, such as Pears, Plantains, Pineapple, Mangoes, Pomegranates, Papaya, and dried ones such as

ed by the stomach and the intestines with comparative ease also.

C. FATS

[The word 'fat' as used in the anatomical sense means "adipose tissue."]

Fats are important articles of diet providing a large amount of energy by their combustion (oxidation), that is, they have a high caloric value. Carbohydrates and Proteins are nearly always associated in food with relatively large amount of indigestible matter such as cellulose and have, therefore, to be taken in large quantities to supply the necessary energy; but fats are present in food in a high state of concentration. Fats have, therefore, this advantage over carbohydrates and proteins. Fats, moreover, are readily stored and laid down in the subcutaneous tissue, where they make an efficient protection against loss of heat and serve as a store to draw upon in time of need. This method of storage of energy by the body is, indeed, the most economic of space.

Fats are contained in animal foods like Cod Liver Oil and other fish oils (Shark oil, Halibut oil) and butter and ghee. All these contain Vitamin A in abundance; while most of the vegetable-oils contains little or no Vitamins, although the oil-seeds or nuts from which the oil is expressed may contain Vitamins to some extent. There is one vegetable oil, however, which is very rich in Vitamin A, and that is the oil obtained from the fruit of Elacis Guineensis, a kind of palm grown in Africa, Malaya and Burma. The oil is called the "Red Palm Oil," the oil being red and not the palm.

Among the vegetable food stuffs containing fats may be mentioned nuts of various kinds, cocoanuts, almonds, cashew-nuts, groundnuts and walnuts.

Fruits contain very little fats with the exception of the Avocado-pear (butter-fruit) which is at present extensively cultivated in Coorg and lately introduced at the Govt. Agricultural Farm at Coimbatore and the Fruit-growing (Pomological) Station at Coonoor, the Nilgiris. It is said to contain about 22 p.c. of fat. Oatmeal, Bajra

potatoes, and fruits like peaches, apricots, prunes etc. Deficiency in Iron in diet brings about anaemia and general weakness with inability to work. The assimilation of Fe, from foodstuffs has been proved to depend upon the presence in them of certain salts of Ca and Vitamin A, B, C, E and also an unknown principle secreted by the liver.

It is interesting to note that if potatoes are peeled before being cooked about half of its Iron is lost in the peel.

In the preparation of white American refined flour about three-fourths of the Iron is lost, so that the wholemeal bread contains four times as much Iron as is present in white bread.

Meat contains as much Iron as there is in wholemeal bread, but only a small fraction of the Iron in meat is available as compared with 4|5 of that of wholemeal bread.

Fish on the whole form a poor source of Iron; cockles, mussels and oysters contain most, while other varieties contain very little.

Iodine (I) is obtained from sea-weeds and is contained in agar. Seasalt contains Iodine and should therefore be preferred to Rocksalt in those parts where goitre (Derbyshire neck) is prevalent. It is a common saying in Northern India that those who can afford the luxuries of tablesalt (seasalt) do not get goitre. Common shoeflowers (Hibiscus rosa Sinensis, chembaratti flowers) and some varieties of colocasia and coleus are said to contain Iodine in a fair amount.

Foods richest in Iodine are dairy products, eggs, green vegetables such as lettuce, cabbages, carrots and to a lesser extent oatmeal, fish and meat and onions and potatoes.

Now there is no single food which contains nearly all the salts and in the right proportion, and milk is the only exception, but even milk is deficient in Iron. Leafy vegetables, tubers and root vegetables and fruits are rich in salts; while, meat, dhal, cereals and pulses and

mentioned above, which are in so much fashion now-a-days as to become a craze.

Vitamins, however, whatever may be their virtues, have no structural or energy value whatsoever; in other words, no amount of Vitamins alone in the diet can promote normal growth and maintain normal health without the necessary quantity and quality of Proteins, Carbohydrates, fats, salts and water. In fact it has been proved beyond doubt that the assimilation of these various elements of foodstuff is, to a large extent, dependent upon the presence of Vitamins. Thus, Vitamin A and B are necessary for the proper metabolism of Proteins and fats, Vitamin B of carbohydrates and Vitamin A, C and D for helping the absorption of mineral salts. Now, since a supply of Vitamins is essential for the animal body they are generally present in the natural foods which are instinctively consumed by man or animals.

In the tropics where carbohydrate foods are consumed in excess, the need for Vitamin B is much more pronounced than it is in colder climates. The wider prevalence of gastro-intestinal disorders in India may have some sort of relation with Vitamin B deficiency. Hence it is advisable to supply even an excess of Vitamin B in the dietary, otherwise the body-metabolism may fail and throw an excess of strain on the system especially during pregnancy and lactation and in the case of growing children. The occurrence of infantile-cirrhosis of liver is perhaps explainable in this way.

Our knowledge of the Vitamins has been largely acquired by the study of the disease, Beriberi; and the discovery of Vitamin B, as a causative factor of the disease from its deficiency in diet can be said to have effected marvellous changes in the health of individuals and of nations, and one of the first Reforms leading to the emancipation of modern Japan, for example, from her mediaevalism of half a century ago was concerned with a problem of this sort. The Japanese Army had been reduced to complete ineptitude by the prevalence of Beriberi among the crew, as more than a quarter of the men were afflicted. Baron Takkai from the study of the dietary

preventable blindness in South India and in any case is more serious than Ophthalmia Neonatorum, (a condition of purulent conjunctivitis occurring in the new-born infant as a result of gonorrhoeal infection of the eyes from the mother's birth canal.) In Bengal and Bombay the same view is held by eminent Eye Surgeons, but in the Punjab which is peculiarly free from deficiency diseases as a rule, the incidence of Keratomalacia is negligible; on the other hand in the United Provinces of India the position of this complaint is the same as in Madras and Bombay or Bengal.

One of the great differences between the Punjab and other Provinces of India, which influences the occurrence of Keratomalacia is that the food in the Punjab gives a more complete diet, the inhabitants being largely wheat-eaters and not rice-eaters as elsewhere; moreover, the Punjabis consume large quantity of milk or milk products like butter, curds and ghee and other Vitamin—rich foods. Hence, possibly there is very little deficiency disease in the Punjab.

Col. Wright of the Govt. Ophthalmic Hospital, Madras, has collected statistics of the incidence of Keratomalacia. He says that blindness is a much more common sequel in Keratomalacia than in ophthalmia neonatorum, in fact it is much rare to lose an eye from the latter disease unless the cornea is already badly damaged when the case reports to treatment.

(3) There is one variety of eye disease—Angular conjunctivitis—commonly met with in badly nourished young individuals, associated with Xerosis and night blindness, and also chronic soreness of the mucous membranes in general especially of the mouth and tongue, with excoriations at the corners of the mouth and hoarseness of voice from involvement of the larynx.

[The author has personally seen several cases of this type in some of the Boarding Schools in Tanjore while in charge of the Govt. Eye Hospital there. Their diet was of the poorest kind, devoid of eggs or milk or its products or meat, except a small quantity of mutton occasionally, once or twice a week, the only redeeming feature

poorer people in Guntur and the adjoining districts. The disease is curable by supplying the deficient Vitamin B_2 through yeast, butter-milk, eggs, liver-meat, or its extract by the mouth or by injection into the body.

A common disease of children traced to Vitamin B (complex) deficiency is the infantile biliary cirrhosis. This disease is curable in the early stage by supplying yeast, fresh milk, fruit juice and cod liver oil, as the deficiency of Vitamin B complex is often associated with Vitamin A deficiency also and deficiency in Ca and P assimilation.

Prevention of some of the vitamin-deficiency diseases can be easily effected if people make their minds to produce as much of their own food supply as possible; many are able to keep a cow or raise poultry, while nearly all can have a small kitchen garden which will supply them with the necessary vegetables and of variety. There is no reason to recommend the discontinuance of a particular food unless it is necessary to make room for food of higher "protective" value; instead, the effort should be directed towards adding to the diet to increase variety, in other words to supplement rather than replace the food one is accustomed to.

4. *Vitamin C*—(Antiscorbutic or scurvy preventing factor, Ascorbic acid) Vitamin C is present in fresh fruits and vegetables particularly cashew, oranges, limes, lemons, tomatoes, spinach, onions, Paprika—in fact all fruits, leafy parts of plants and all root vegetables—potatoes, carrots etc., contain it more or less. Germinated grains are rich in Vitamin C. The antiscorbutic value of meat is low; yet indeed it must be the raw frozen and often putrid meat which preserves the Eskimo from scurvy (he being so named as he does not cook his food) for, when he adopts European food and method of cooking scurvy takes its toll of him.

Eskimos of northern Greenland protected by the Danish administration from harsh contact with civilisation still lead a primitive existence. Their diet, entirely carnivorous, consists of the flesh, glandular organs and often entrails, usually eaten raw, of Arctic animals, birds and fish. Their life of great physical activity, in

and bend causing varying degrees of deformity depending on the amount of pressure they undergo.

Prevention of Rickets. A proper intake of Ca and P salts with Vitamin D is needed to prevent rickets. The Ca and P can be assured by an adequate supply of milk, and Vitamin D by supply of Cod liver oil or other fish-oils of proved antirachitic value; yolk of eggs may be added to the infant's diet even at an early age. If sunlight is available—and it is abundant in our climate—sunbaths are recommended provided it is begun with a few minutes of exposure and gradually increased.

The use of milk from especially fed cattle seems to offer great possibilities in the prevention of rickets.

6. *Vitamin E.* (Antisterility-factor). This is present in vegetable oils particularly wheat-germ oil, embryos of cereals (Beemax) the green leaves of plants, eggs, corns, peas and whole milk. The absence of this vitamin from diet leads to sexual sterility.

(There is little evidence that there is deficiency of this vitamin in human diet or indeed that the results apply at all to human beings—witness the fertility of the very poor who obtain very little Vitamin E in their food; none-the-less claims have been made that vitamin E is of value in habitual abortions.)

* * * * *

Before we leave the subject of vitamins it would be well to sum up here the matter from the practical stand point. There is no question that our present day dietary is on the whole deficient in the matter of "protective" foods, such as vitamins and mineral salts. Fortunately in nature, we have seen, whatever foodstuffs supply vitamins do also supply the essential mineral salts. When appraising, therefore, the physiological value of a diet it is not necessary to scrutinise it carefully for the presence of this or that vitamin and of this or that mineral salt, but it is sufficient to see that our daily menu includes such substances as (1) milk or its products—butter milk etc., (2) fresh vegetables and fruits, (3) eggs, liver and fish, and if this is done the essential needs will be covered and

and lactation do require more food and of an easily digestible and better quality containing fats, vitamins and salts of Fe and Ca.

2. *Activity.* The degree of *activity* is by far the most important factor in determining the food requirements above that necessary for mere sustenance. Lowered levels of nutrition and susceptibility to certain forms of disease are entirely due to failure of properly adjusting the quantity of food-intake to the needs of muscular activity and work.

This adjustment of the quantity of food to the amount of work done is important *at all age levels*, particularly for middle aged persons leading a sedentary life after a strenuous one during adolescence or adult age.

3. *Climatic Conditions.* In a cold climate man is naturally capable of more work than in a warm climate. Food requirements are, therefore, greater in cold climates than in hot. People of cold countries require more fats to produce greater amount of body-heat, than those of warmer countries; of course carbohydrates would equally serve this purpose, but carbohydrates are only less than half as useful as fats; moreover in very cold climates carbohydrates are not so easily obtained as fats. This is the explanation of the enormous amount of blubber fat, which the Eskimo consumes, sometimes as much as 20 lbs. a day; a similar adaptation to circumstances on the part of Nature is seen in the milk of the Walrus, which contains as much as 40 p.c. of fat (while ordinary cow's milk does not contain more than 3·5 or 4 p.c. of fat), the object of nature in these cases being to supply the young animal with an abundant and compact source of fuel and enable it to maintain the body temperature in the icy-waters of the Arctic regions. The milk of some kinds of mammalian Whales is said to contain about 43 p.c. of fat.

Even in our own Country those living in the Northern parts require more food than those in the South, nearer the Equator.

1. *Quantity-requirements of Proteins.* As protein forms the essential part of the body cells and is present

but exerts a retarding action on the material cooked in it. This is due to the fact that the secretion of the gastric juice is restrained by fat, and that articles cooked in fat are rendered impermeable so to say, to the digestive juices.

Fats and sugars and fruits taken as desserts also have a great satiety value; but it is only the richer classes that can afford such foods as they are comparatively expensive. The poorer classes have to resort to inexpensive foods like tapioca, ragi, pulses, grains and cheap fruits such as jack fruits and seeds, papaya, plantains etc. It should not be understood that these satietary foods taken by the poor are devoid of any real nutriment; on the other hand, some of them are very nutritious especially ragi, grains, papaya and plantains; and raw cocoanuts and jack seeds, which are often taken as food by the poorer classes have of late been proved to be fruitful sources of nutriment and Vitamin B_1 and B_2.

The feeling of satisfaction from any foodstuff depends, we mentioned, on the sense of fulness and the time taken by the food to stay in the stomach.

B. FOOD ENERGY AND VITAL ENERGY

The body is frequently compared to a Heat Engine and in so far as the oxidation of the energy-yielding material and the production of mechanical energy and heat are concerned, the analogy is an apt one; but there is, however, a most important difference between the inanimate heat-engine and the living-body mechanism, *viz.*, when the inanimate engine ceases to work it cools down and remains in that state unless started to work again, and it is at this point that the analogy between the living body and the mechanical engine breaks down; for the living mechanism is constantly producing heat and enough of it to maintain the body temperature against constant tendency to lose heat. It is obvious that this heat production must continue even in the absence of readily available supply of energy material, that is, even during starvation.

Briefly, then, for the bare maintenance of the living

Fats	80—90 grammes ×9	
	(Rubner's figure) =	720 to 810 calories.
Carbohydrates	360—450 grammes ×4	
	(Rubner's figure) =	1440 to 1800 calories.
	Total	2520 to 3010 calories.

Now, this total energy should be distributed among the three chief types of food-elements in the required proportion as all these elements are needed for the body processes: roughly, Proteins: Fat: Carbohydrates = 1: 1: 4. Now, there is no single article of food which contains all the different nutritive constituents in the above mentioned proportions; some foods are too rich in Proteins, others contain too much Carbohydrates or Fats; the former statement is true of all animal foods, and amongst the vegetable foods, of such articles as peas, beans, lentils. Most other vegetable foods such as potatoes, rice, bread contain an excess of carbohydrates. The practical outcome of this is that a proper diet must be a "mixed one," the excess of one particular element in one article of food balancing the defect of another article; this is true also in respect of the vitamins.

Man has found this by experience and has adopted certain combinations, such as, bread and cheese, beans and bacon, potatoes and beef, the surplus of the carbohydrate and fats in the first article being balanced by the excess of protein in the second. That man is right in doing so is borne out by the disastrous results which have followed attempts to live for any length of time on one single article of food (with the exception of meat in the case of the Eskimo or milk in the case of babies). One observer, Hammond, tried to live himself on a daily ration of a pound and a half of starch along with water. He had to give up the experiment on the 10th day owing to the onset of extreme debility. On a second occasion he tried to live on albumen alone; after the 9th day diarrhoea set in with dropsy and cessation of urine.

The need for a mixed diet. We may now study how it is possible for life to be best sustained through ordinary foodstuffs with the greatest *economy* as regards the

Thus by taking milk, milk products and green leafy vegetables we make good four of the defects of the wheat: fats, suitable proteins, Vitamin A and Vitamin C.

(e) A fifth defect of *atta* is its deficiency in Vitamin D; a food-stuff has, therefore, to be selected to rectify this, and we can choose either milk and its products—butter or ghee—or egg or fish oil for this purpose. Any one of these, or the action of sunlight on the body with an occasional oil bath will provide all the Vitamin D we need.

(f) A sixth defect of atta is its deficiency in certain mineral elements, particularly Ca, sodium and chlorine. They can be best supplied by green leafy vegetables, fruit and milk; and as wheat does not contain much Iron some of the vegetables used should be rich in Iron, such as whole cereals, dhals, spinach, onions, radishes, asparagus, celery, amaranthus, cucumber, tomatoes etc. It is well to combine *atta* with plenty of vegetables and fruits, so that the non-irritating vegetable matter may help the action of the bowels, and the acid-producing tendency of the *atta* may be counteracted by the alkali-producing tendency of the vegetables and fruits.

We see, therefore, that if whole-wheat flour (atta) be the staple article of diet and we take with it milk, milk products, dhal, green leafy vegetables and fruits with flesh-meat occasionally we get everything the body needs for health, strength and vigour.

Now, this is precisely the kind of food which the wheat-eating races of Northern India do eat if they can get it, and for this reason no races of mankind are better developed physically or more capable of endurance and hardwork. But it is only when they actually eat this kind of food and make good each and every one of the defects of the wheat that they remain in good health and vigour even unto old age.

* * * * *

II. Suppose the staple article of diet is *Rice*. The rice may be raw, home pounded or polished; or, parboiled hand pounded or polished.

(a) Whatever rice is used it contains enough carbohydrates or fuel food, but its proteins are not only scant

almost wholly composed of rice—as when people are so poor that they cannot afford to buy other foods except in minute quantities—then the state in which the rice is eaten becomes of paramount importance. Parboiled rice even when milled is superior in nutritive value (particularly as regards the anti-beriberi Vitamin B_1) to raw rice milled to the same extent.

Diets in Children's Houses and among the general population are often low in fat. Addition of extra vegetable oil (at the expense of a quantity of a cereal supplying an equivalent number of calories) does not greatly increase the cost. Pure ghee or butter is of course preferable to vegetable fat, but they are very much dearer.

Pulses are rich in proteins and some of them in B Vitamins. Two or three ounces per day increase the nutritive value of a diet largely composed of cereals. Pulses in general, however, are less valuable dietary supplements than animal foods such as milk, fish, meat, etc.

Groundnuts.—More use could perhaps be made of groundnuts as human food as they are richer in various food-elements including B Vitamins. Half to one ounce daily helps to supply some of the elements in which poor rice diets are deficient.

Fruits.—These should always be included in children's diet. Plantains, a cheap fruit often supplied in hostels are good food, but not of an exceptionally high nutritive value. Tomatoes, oranges and other juicy fruits are richer in vitamins and make a useful addition to diets of a poorer type.

Leafy Vegetables and Fish.—These are particularly rich in Vitamin A and C and in Calcium and Iron, and form a valuable and cheap supplement to rice diets.

The development of kitchen gardens and wider use of leafy vegetables are therefore desirable. In fact each person should make it a principle to "grow his own fruit and vegetables." The kitchen-garden habit is part of our heritage, but with the rapid urbanisation of our rural folk the art is being neglected.

If efficient methods such as those employed in Japan and Europe are applied to the fish industry a valuable

should be the aim; since the rate of growth of a child decreases with advancing age, approximately the same amount of the protective foods will suffice for 10—15 years old children as is required for the 5 years old child.

7. General recommendations:

(a) Although a simplified diet may be so constituted from a few protective foods as to be satisfactory, it is a general principle that *variety* in diet tends to safety, provided it contains a sufficiency of the protective types of food materials.

(b) White flour in the process of milling is deprived of important nutritive elements; its use should be decreased and partial substitution by lightly-milled cereals and especially by potatoes is recommended.

(c) The consumption of an excessive amount of sugar is to be condemned, and in this case also partial replacement by potatoes is urged.

(d) Milk should form a conspicuous element of the diet *at all ages* and in the case of pregnant and nursing women; skimmed milk or separated milk is of high nutritive value; although deprived of Vitamin A through removal of fat it retains the protein, Vitamin B and C, the Ca and other mineral salts.

(e) Fresh vegetables and fruits should also form the constituents of the normal Mixed Diet. Adequate provision of the vitamins (other than Vitamin D) can be readily accomplished by inclusion in the diet of optimum amounts of protective foods. Where these are not available only such vitaminous preparations as are Officially controlled and approved should be permitted.

(f) The Commission emphasises the need for provision of extra Vitamin D either as cod-liver oil or as irradiated products wherever and whenever sunshine is not abundant, especially in the period of growth and during pregnancy.

* * * * *

Another Expert Committee—The Advisory Committee on Nutrition—appointed by the British Ministry of Health recently to carry out a survey of Nutritional Condition in Great Britain and suggest suitable mea-

diet may be an all-round deficit, i.e., in all the most essential constituents of food, but it is more usual to have a deficit in only one or other of the constituents; in other words, an ill-balanced diet is more frequently met with than an insufficient diet and is the commonest form of underfeeding; and, as proteins and fats are usually costlier than carbohydrates it is more likely that proteins and fats will be lacking rather than carbohydrates. We have seen that insufficient protein intake results in insufficient tissue repair, with the consequent production of "pallor and puffiness" characteristic of the underfed, and this observation has been confirmed by experiences gained in the late World-war of 1914-18. 'War-oedema' among the Germans was probably the result of too little protein. Too little fat in the diet usually arouses a craving for fat itself and incidentally for the Vitamins A and D contained in most fats, especially of animal origin; and it is the experience of all dietecians that "an all round low intake of calories during the growing period of entrants into Public Schools was followed by a deficit in their height and weight during the next 10 years." It must be noted, however, that experience of the War has shown that it is possible for life to be maintained and normal work carried out on a diet very much less than that to which an individual has been accustomed. This is explained thus:

"The first effect of diminution of food is a diminution in the weight of the body; the individual, if he remains at his work, puts out at first the same amount of energy as before, the energy lacking from the food supply being made good by the fat and muscular tissue of the body itself. But when under this regime of diminished supply of food the weight of the body has fallen by 10 to 12 p.c. it is found that his basal requirements are largely reduced as we have seen already; that is to say, under the altered conditions of food supply the body processes also are carried out more economically, and there is no diminution in the actual expenditure of energy required for doing a certain amount of work, the individual being more economical in effort and "economising his muscular activity to the utmost possible extent." This state of economical

therefore, consults a Medical Dictionary in the British Museum and goes through its pages from A to Z, imagining all the while that he had some part of his life all the diseases from Ague to Zymosis, except the House-maid's Knee].

"On the other hand" McCarrison continues, "hygienically-housed animals and fed on a well balanced diet composed of natural foodstuffs so combined as to provide in proper amount and form, the proportion of all elements and complexes necessary for normal nutrition, showed not only freedom from disease but lived a long life also. Premature deaths were rare in them except by accidents."

Two diets were employed by McCarrison to test their effect on the production of disease; One resembling that eaten by the poorer classes in Madras, consisting of rice, chillis, tamarind, a little fish and "Conjee"; the other approximating the diet of the poorer classes in Travancore, consisting largely of Tapioca root (which is the staple food in those parts), rice, a little fish, chillis and rice water.

Both these diets were very poor not only in salts and Vitamins A, B and C but in respect of proteins also. In either of these classes of animals the incidence of gastric ulcer was 11 and 28 p.c. respectively. Here is an explanation, then, why gastric or duodenal ulcers are common in South India especially in Malabar.

[I have personally seen tens of these cases in Malabar and Madura, and operative treatment is the only form of treatment that has succeeded so far. On the supposition that either the want or deficiency of vitamins is the prime cause some observers have reported excellent results in the treatment of gastric ulcers by means of either vitamin—rich foods or foods supplemented by vitamin—extracts].

HYGIENE OF DIET

Even physicians often neglect or underestimate the effects of emotional states upon body-nutrition. Repeated scientific experiments and observations have demonstrated direct bearing of the emotions upon the digestive

moment to the infant as it enters the world with a large amount of Fe obtained from the mother's blood.

All the vitamins have been detected in milk, but it is a liberal source of at least two of them, *viz.*, Vitamin A and B. The antiscorbutic value of milk (Vitamin C content) is variable and depends to a large extent on the Vitamin C contents of the animal's fodder; cow's milk has a relatively small concentration of Vitamin B_1 and B_2 (G), while human milk has only half as much of these factors as cow's milk. It is obvious therefore that cow's milk cannot be considered as a potent source of vitamins except Vitamin A. This is the reason why a sufficient quantity of fruit and vegetable juices should be given to children brought up entirely on boiled or even pasteurised cow's milk, because Vitamin C, as we have seen is destroyed by heat.

The Vitamin D content (antirachitic principle) of cow's milk is very poor also, and children reared on it should have plenty of sunlight, or if this is not available 20 to 30 drops of Cod liver oil after each feed.

Quality of Milk. Both from the economic and dietetic points of view it is advisable to have a standard by which the quality of milk could be judged; and seeing that it is the solids contained in milk that we want and not the water, it may be supposed that the specific gravity of the milk would be a sufficient guide for all practical purposes. The average Sp. gr. of a good sample of milk is between 1026 and 1032, that of water being taken as 1000.

Now fat is lighter than water and this is the reason why it rises to the top as cream when milk is allowed to stand. Hence, a specimen of milk plus its cream has an actually lower Sp. gr. than one from which the cream has been removed. The artful milk vendor knows this, so he skims his milk and then lowers its Sp. gr. by the addition of water. He can thus effect a double adulteration—adulteration in quality and quantity—without lowering the Sp. gr. of the milk. To detect if milk has been adulterated with water note the Sp. gr.; good milk has a Sp. gr. of 1024 to 1034, and when allowed to stand for a few hours

Tuberculosis in all its forms, Typhoid and Paratyphoid fevers, diphtheria and scarlet fever, septic sore throat and other forms of infection, gastro-enteritis and summer diarrhoea of children or of adults, cholera, dysentery and so on. Some of these however, are due to spreading of the infection through contaminated water used by the milk man to wash his hands or utensils or for adulteration of the milk.

MILK AND TUBERCULOSIS

The most serious, though perhaps the least obtrusive of all forms of milk-borne diseases is Tuberculosis. Surgical tuberculosis had existed from the earliest days of human history, as specimens of its ravages upon the Spine have been found in Neanderthal man and in mummies of ancient Egypt.

The minds of men, says Lord Moynihan, are not so much moved by the evils to which they are grown accustomed as by novel or new fangled and therefore startling events of perhaps far less significance; we are naturally horrified, he says, at the loss of a million people in four years of War; yet we submit without concerted rebellion to the loss in the British Isles of 50,000 people every year from Cancer and of not less than 100 people every day of every year from tuberculosis, though some proportions from both are certainly preventible. From 1921 to 1928 there were over 320,000 deaths from Tuberculosis; of this 'white plague,' Tuberculosis, there are two forms:

(1) The *Human* form, derived from contact with those suffering from consumption (Tubercle of the lungs) and (2) the *Bovine* (derived from the cow through the milk) causing most of the conditions known as the Surgical Tuberculosis—which affects bones, joints, glands, intestines and vertebrae. A large proportion of these cases derive their infection through tuberculous milk. The infection falls first, say on the tonsil, whence it is conveyed to the glands of the neck, where it causes enlargement and perhaps suppuration. Every one has seen the scars resulting from abscesses so caused; in other cases the brunt of the disease is borne by the bones, and numerous operations

3. There is every reason to advocate the habitual application of one or other of the above methods to milk before it is consumed as food, and one looks forward to the day when the drinking of raw milk will be considered as barbarous a custom as the eating of raw meat is at present.

PRESERVATION OF MILK

Milk can be preserved by:

(1) Pasteurisation or raising the milk to a temp. of 167°F. for 30 min. and then rapidly cooling it. All the pathogenic microbes are destroyed by this process and the souring of milk is delayed for 48 hours by inhibiting the fermentation process.

(2) "Buddeisation" of milk—by the addition of Peroxide of Hydrogen to milk and heating to a temp. of 51°C for 3 hours. Buddeised milk remains normal in taste and keeps fresh for about a week.

(3) Drying milk by passing through overheated rollers so as to reduce it to a fine powder.

(4) Addition of antiseptics like formalin, boric acid etc.

(5) A new method has been described by Davis of the National Institute for Research in Dairying. It consists of adding a certain quantity of dilute hydrochloric acid to milk and maintaining it at about 38°F. In this way the milk can be kept for a fortnight. When in use it can be brought back to its original taste and flavour by the addition of the same quantity of dilute Caustic Soda solution.

This method is said to remove one of the minor annoyances of ocean voyages of up to a fortnight's duration, and to be useful in time of war when delays in transport may be both unpredictable and unavoidable.

GOAT'S MILK

Goat's Milk is perhaps a much better article of food than Cow's milk for several reasons, and it is strange that it has not received sufficient notice by the medical profession in India; perhaps the prejudice against the use of goat's milk is due to the prevailing idea that goats

the stomach-lining of the calf) is added to warm milk and the milk set aside for an hour or two it is *firmly* coagulated. The coagulum or junket can be separated by filtering through muslin, and the whey drains out. Junket contains most of the casein and fat, while the whey contains nearly all the sugar (lactose), most of the mineral salts and some casein.

Instead of rennet any weak acid such as lime juice or even vinegar can be used to prepare whey. The milk is first boiled and when it has cooled down to a comfortable heat (as judged by touching the milk can from outside) lime juice is squeezed into it. Juice of half a fruit is sufficient for a pint of milk and the whole is set aside. After about 20 to 30 minutes the milk curdles; the whole is next strained through muslin, when, the whey will drain; the curd is then rubbed into the meshes of the muslin so as to enable it to pass through it into the whey below.

Whey prepared in this manner contains practically all the ingredients of the milk in a very fine and consequently more easily digestible form. In fevers like Typhoid fever milk is best administered as whey prepared in this manner.

KOUMISS AND KEFIR

These are in reality preserved milk containing lactic and carbonic acid and a little alcohol. Koumiss is fermented *mare's* milk, its home is in the Steppes of European Russia, and its brewers, the tribes of Nomadic Tartars; the ferment concerned is the Bulgarian bacillus. The lactose of the mare's milk undergoes a double fermentation—production of lactic acid and production of alcohol and carbonic acid. Koumiss is therefore, more readily digested than "Dadhi" on account of the stimulating action of alcohol and the CO_2 on the stomach mucous membrane.

Kefir is an imitation of Koumiss and is produced by fermentation of cow's milk by means of Caucasian mushrooms or by yeast.

BUTTER

Butter is obtained by churning milk with its cream or soured milk (curds); the flavour of butter is due to the

substances held in solution in its juice; these are called "Extractives" as they can be "extracted" from meat by means of boiling water. Their exact chemical nature is not quite known and they have not much nutritional value, but are of importance as being the chief cause of the characteristic taste and flavour of meat, and when these are removed as by prolonged boiling the meat becomes flavourless and insipid.

Extractives are to a certain extent stimulants and are used in exhausting diseases.

Fish is very much deficient in these extractives, fish is therefore, not a stimulant; for this reason fish is sometimes recommended in the place of meat for epileptics and for the same reason fish can with advantage be employed by people of sedentary habits and in the hot weather.

Commercial Extracts of meat, such as Liebig's contain only small quantities of nutriment (albumoses and peptonoids) and Potassium salts; they may, however, serve as good appetizers and pick-me-ups after fatigue or exhaustion of disease or in convalescence. Panopeptones and Liquid Peptonoids are also similar in their composition and effect, perhaps with a small amount of alcohol added. Even Liebig himself has said of these Extracts: "They cannot make us strong but make us aware of our strength."

While the title of "food" cannot be denied to these extracts as they do contain a certain amount of peptones and albumoses, they are foods only in theory and have to be taken in large quantities to enable them to contribute to real nutrition. It is estimated that in order to supply an invalid with the daily need of protein he requires, as much as 16 oz. of these Extracts may have to be supplied to him. Such a quantity is on the face of it impossible to consume owing to the enormous quantity of salts and Extractives which it would contain. Moreover, the cost of these articles would alone be sufficient to prohibit their use as a common article of food.

Personally we have not much faith in the stimulant properties of these extracts, atleast in doses ordinarily prescribed to our patients, and if the dose should be increased

will lay eggs worth about 10 to 12 annas. By keeping 30 hens one can earn a profit of about Rs. 10 a month or Rs. 120 a year with very little initial expense and trouble.

It is a distinct economy and advantage to keep fowls in a small way as a side line to general farming as the birds utilise enormous quantity of waste products, grains and vegetables from the farm; very often they eat insect pests and grubs or larvae and so assist to eradicate the pests which might damage the crops. In newly harvested fields the fowls will eat the shed grains, which would ordinarily be wasted. There is thus a saving in the cost of keeping fowls. Poultry dropping is very rich in ammonia and phosphates and form an excellent manure for crops and the vegetable garden.

From an economic stand-point and stand-point of yield of eggs there are several breeds which lay large number of eggs as many as 200 to 250 in a year such as the leghorns, the light Sussexes and Rhode-Island reds. Fish meal and shell grit given to fowls with grains fattens them and improves the size and quality of the eggs, the Ca salts in them improving the egg-shells so as not to be easily damaged during incubation.

VEGETABLE FOODS

A. CEREALS

The staple food of nearly half of the Indian population is Rice. In the Punjab, U. P., Oudh, Behar, C. P. and Gujerat in the North and in Madras Presidency in the South, the poor classes live on millet and gram and the richer classes adopt wheat or rice. In Bengal and Orissa rice forms the principle food and grows unsown in the Sunderbans, delta of the Ganges. In Mysore and the West Coast rice and ragi are commonly used and wheat to a less extent. In the colder regions of India, the Frontier Provinces and Baluchistan, maize is generally eaten with rice.

Cereals are so named from Cereus, the God of Harvest, doing six months' work and six months' sleep. Botanists classify cereals under "grass" but man uses only the grain, and the grain of grasses forms a complete fruit and seed.

	Moisture p. c.	Proteins p. c.	Fat p. c.	Carbohydrates (Starch) p. c.	Ca p. c.	P p. c.	Fe p. c.	Vit. B₁ Units per 100 grammes	Vit. A and Vit. C
1. Rice (Raw and Home Pounded)	12·19	8·49	·35	78·27	·007	·165	2·2	100 units	...
2. „ Parboiled „	12·63	8·50	·39	77·62	·010	·277	2·75	100	...
3. „ Raw-Milled	12·96	6·85	·55	79·14	·007	·108	1·7	26	..
4. „ Parboiled-Milled	13·29	6·44	·64	78·86	·007	·149	2·2	100	...
5. „ White-Puttu	12·97	7·57	·37	78·75	·008	·084	3·3	100	...
6. „ Black-Puttu	12·26	7·69	1·27	76·88	·012	·241	4·93	100	..

(*After Aykroyd.*)

available for tissue-building as judged by their amino-acid make-up. The husk of the oats being closely adherent to the kernel cannot be entirely separated, so that by the ordinary methods of grinding a good deal of cellulose is left in the meal; this cellulose acts as a stimulant to the bowels and makes oats a valuable diet in cases of chronic constipation with piles especially.

Oatmeal porridge is easily digested and is easily absorbed leaving comparatively little residue.

Quaker Oats and Rolled Oats are whole oats fried and crushed, by which part of the starch becomes converted into dextrin.

RAGI *(Eleusine coracana)*

There are several cultivating varieties, of which Eleusine stricta is often surprisingly productive. It forms the staple food of a large population of India especially the poorer and labouring classes and is the premier crop of the Mysore State and neighbouring Districts; and is perhaps the cheapest foodgrain on the market with a traditional reputation as a nutritious and sustaining food. Feeding experiments have shown that animals maintained exclusively on a diet of ragi showed considerable increase in weight; but it is somewhat slow of digestion on account of the rough husk, which has a laxative effect. Contains a phosphorus-containing protein 8 p.c., Carbohydrates 76 p.c., Fat 1·3 p.c. and large quantity of minerals and Vitamin A and B_1. Ragi contains a prolamin of high biological value, and on germination produces a highly active diastase, more potent than that obtained from cholam. Ragi can therefore be used for the manufacture of Malt. Ragi malt has an extremely agreeable aroma, yields about 74 p.c. extract and possesses good keeping qualities.

Ragi is employed in Africa for preparing a fermented liqour similar to beer.

KOOTU OR BUCKWHEAT *(Fagopyrum esculentum)*

Used by the poor classes in Northern India. Its composition is Proteins (15·2 p.c.), Fats (3·5 p.c.), Carbohydrates (63·6 p.c.), minerals and Vitamin B_1 in good

amounts to about 36 oz. for the 24 hours all the demands of nutrition are satisfied. But the question is if anyone can go on consuming such a quantity for any length of time. It comes then to this: that while the pulses are most valuable sources of Protein, they are not adapted to be the exclusive diet for purposes of health. As a cheap and suitable means of supplementing the deficiencies of Nitrogen in a purely vegetarian diet, however, their use is strongly advised; and it is a pity that they are not more largely taken advantage of by people as a means of saving money also; for, unquestionably *the pulses are amongst the cheapest of foodstuffs with the maximum amount of nutrition.*

The husk of pulses is a good feed for cattle improving the quantity and quality of the yield of milk, as the husk contains valuable mineral salts and a fair amount of nitrogenous matter.

BENGAL GRAM *(Cicer arietinum) Chana*

Contains about 18 p.c. proteins,
5·5 p.c. fats,
and 10 p.c. salts, of which 9·8 p.c. is formed by Fe.

Vitamin A, B_1 and B_2 are also contained in the gram. But roasted Bengal gram is devoid of all these vitamins. Vitamin C is however, absent in all pulses in general as noted already, except when they are *sprouted,* in which case their Vitamin C value is considerably increased.

Kesaridhal is the split Bengal gram, is more nutritious than the whole gram but entirely deprived of the vitamins of the whole gram.

BLACK-GRAM *(Phaseolus mungo)*

Is the "masha" mentioned above and is an excellent nutritional equivalent of meat in respect of amount of Proteins, their digestibility and their absorption. Black gram is rich in Fe and vitamins.

COW GRAM *(Vigna catiang)*

Contains more protein than either Bengal gram or Black gram but less of mineral salts.

Baly remarked in his enquiries with the diseases of prisoners that wherever potato was used scurvy was unknown. We have already referred above to the outbreak of scurvy following the great potato famine in Ireland.

One important general consideration that has to be borne in mind is that the mere cooking of these foods robs them of a large quantity of mineral salts present in them and also some of the nitrogenous elements in which they are already so deficient. For this reason the water in which they are cooked should not be wasted but should be utilised as far as possible, or, which is more preferable, they should all be cooked by *steam* and *with their skins intact*.

As regards the digestibility of this class of food in general it may be said that it mainly depends upon the amount of cellulose which each of them happens to contain; but it is true that they are only indifferently absorbed and are prone from their bulk to derange the stomach and bowels if eaten in large quantity.

POTATO *(Solanum tuberosum)*

Potato is "the world's greatest plant" and is one of the most widely cultivated crops in the west. It is used for food for man and animals and for the manufacture of starch and industrial alcohol. Potato is grown all over the world.

It is said that potato was first discovered by the Spaniards in the neighbourhood of Quito in Equador, where it was under cultivation early in the 16th Century. It was also found in Peru and Mexico and was known as "papas." The explorers carried it to Spain in 1535 after the conquest of Peru, and it is said a Monk, Cardan was the first to introduce it from Peru into Spain. It was introduced into England in 1586 by Sir Francis Drake, and now forms an important staple article of food of many nations.

If the potato is cut across with a sharp knife three distinct layers can be made out with the naked eye:

(1) The thin outer skin or rind.

ing disease. These germ-killing and tear-starting chemicals were isolated for the first time by Vollrath and Lindegreen of California. The germ killer from onions is allyl aldehyde, that from garlic is the less poisonous crotonic aldehyde. Tests are now under way to determine the usefulness of these substances in healing infectious diseases due to germs. The fact that onions do not spoil readily and have remarkable resistance to bacterial attacks led to the present discovery.

An Italian Scientist, Gurwitch, first found out that root crops, and particularly onions emanated ultraviolet ray or M. Ray or Gurwitch ray. This ultraviolet ray is made available to biological specimens by the simple process of transferring the energy into water. Country onions about one inch in diameter are used for this purpose. The emanations continue 24 hours after removal from the earth. After washing the earth onions are placed with the roots intact in 100 times their volume of water in a glass or mud vessel, (which are bad conductors) without any metallic contact. The ultraviolet ray in the onion is gradually transferred to the water. This onionised water has certain peculiar properties which are utilised in agriculture. Seeds previously soaked in this water before sowing do germinate more readily and crops irrigated with water passing through a bed of onions do thrive very well.

Dr. Misra of U. P. who has made tests in this direction reports that a bed of 10 ft.×10 ft. with onions thereon is sufficient for irrigating one acre of land and that two such beds would facilitate their alternate use, thus giving time or the revival of energy for each bed on the day of rest. Such easy methods do not add to the cost of cultivation but easily increase the yield.

Dr. Misra has found that onion water charged with M. rays is medicinally useful in the treatment of renal and intestinal colic, constipation, sore eyes, sore throat, ulcers burns etc., and also enlarged thyroid (Derbyshire neck) and bubonic plague.

GARLIC *(Allium sativum)*

Garlic also is rather a condiment than food and con-

matter and nearly the whole of their nonprotein nitrogenous matter in the gravy. The deficiency of fat in vegetables is overcome by the addition of butter or oil in the course of the preparation for the table.

Vegetables, as a whole, are most easily digested in the stomach; cauliflower, it is worth knowing, is much the most easily digested of all of them. In the intestines also, vegetables are difficult to deal with because of their bulk and amount of cellulose which they contain. Flatulence is thus apt to be produced.

Vegetables when stale are apt to ferment in the intestines. To be wholesome they should always be eaten as fresh as possible.

The absorption of the nutritive constituents of most vegetables is also rather defective. They constitute one of the few forms of food from which even starch is not completely absorbed.

When one realises that green vegetables are poor in nutriments to start with, that they become still poorer on cooking and that even of the remnant which reaches the intestine a large part escapes absorption, one can readily understand, considered as foods they are of very low nutritive value. Indeed, it may be said that green vegetables are only of use in diet for the following reasons:

(1) They supply 'ballast' to the intestines, the indigestible residue which they leave behind being a mechanical stimulus to the intestinal movements. Hence their special value in constipation, especially of the chronic type.

(2) They are a valuable source of mineral salts, especially compounds of Potash, which help in the maintenance of the alkalinity of the blood, and also in lowering the acidity of urine. The alkaline salts are also useful in some forms of skin disease, such as chronic Eczema; Clement Dukes points out that there were several epidemics of eczema resulting from a deficiency of green vegetables in the diet of school boys.

The free use of green vegetables is recommended for patients suffering from "gravel" also.

India, the long pulpy and the small. Both are bitter and are in common use, both contain fair amount of Fe and Vitamin A, B and C. They are good stomachics, liver stimulants and laxatives. An allied variety of gourd but sweet, known as Meripavaka (Tamil), Phagil (Konkani), Parval (Hindi & Bengali) is a rare delicacy. It grows wild in jungle parts.

3. *Pumpkin (Cucurbita maxima), Chinikai, (Nallapasini; Gummadi)*. It is called Chinikai in Canarese either because it is originally a Chinese product or because it is sweet, as some varieties are. Contains Vitamin A, B and C in small quantities.

4. *Ridge gourd (Luffa acutangula), heerekai, (Peekankai)* is a sweet variety commonly grown in South India, contains traces of Vitamin A and B_1. There are several varieties of these grown in South India.

5. *Milk gourd* or Bottle gourd or Calabash cucumber *(Laginaria vulgaris)*, Soraikai. Is a nice diuretic and recommended in cases of catarrhal jaundice being a liver stimulant also. No vitamins.

6. *Snake gourd (Trichosanthes anguina)* Padalangai, *Padual*. A sweet variety containing 5 p.c. of carbohydrates, trace of mucin, iron and Vitamin A. Has a peculiar flavour like prussic acid.

(There is a bitter and smaller variety used in medicine by the Hakims and Vaidyas. It has antipyretic and antiperiodic properties).

7. *Cucumber (Cucumis sativus)*. There are several edible varieties, some of them are eaten raw, or cooked in the tender and unripe condition; others eaten only when ripe and are like melons. They are crisp when tender and have an agreeable flavour and used in making sandwiches. Contains traces of Vitamin B and C. *(See 'melons' later)*.

8. *Goa fruit*—Kovaikai *(Coccinia Indica)—Tondaikai*—grown extensively on the West Coast and grows wild in the hilly tracts of the Circars. The unripe fruit is used cooked as vegetables.

Chow-chow *(Sechium edule)*—Bilati Baigun. The marrow is sweet when cooked from the presence of carbo-

are amongst the most nutritious foods we possess. Their general composition is as follows:

Protein	15 to 30 p.c.
Fat	50 to 60 p.c.
Carbohydrates	10 to 15 p.c.
Mineral Matter	1 to 2 p.c.

Vitamin A, B_1, B_2 in varying quantities and Vitamin C only a trace.

Water forms about 4 to 6 p.c. even in dry nuts and oil seeds and cellulose about 4 p.c. on the average. It will be seen from the above that fats predominate very largely in the composition of nuts and there is no other vegetable substance so rich in fats as these. Advantage has been taken of this to prepare from nuts various fatty preparations which are used as cheap and efficient substitutes for butter in the kitchen. There is every reason to believe that the fuel value of these vegetable fats is equal to that of butter, while they are decidedly more economical also.

Ordinarily nuts are not readily digested in the stomach owing to their richness in fat and cellulose; by thorough mastication or by artificial grinding, frying or cooking this difficulty can be overcome. Regarding the absorbability there is no question that a large percentage of constituents of nuts is absorbed in the intestines, so much so it has been proved that it is quite possible even for long periods to supply the requisite proteins and energy from a diet made up of selected fruits and nuts. Fine division greatly aids their digestibility.

The nutritive value of nuts is no doubt extremely high and when suitably prepared they may form substitutes for meat to a considerable extent, as they, like meat, contain much protein and fat in small bulk. Nuts are even more concentrated food than cheese and should rather be used as part of the ordinary diet than as a supplement to an otherwise large meal.

The biological value of the protein of nuts is said to be below that of legumens.

Chestnuts. Of all the members of this class of foods the chestnut is probably of the greatest general value as an article of diet. It is peculiar among nuts in containing

Dhoop oil (Vateria Indica) (Payinia, Malayalam). The tree grows wild along the West Coast of India and extensively cultivated as avenue trees in many places. They grow stout and tall, the timber is used for roofing purposes and lasts long as the wood contains a resinous substance which resists dry rot; the wood forms good fuel also burning with a bright flame by virtue of the resin.

The fruits are oval and resemble sapota fruits in appearance, size and shape; the peel is thick, gummy and can be easily separated for the kernel. The kernel is full of oil and little protein or nitrogenous matter. In the extraction of the oil the kernel is ground down with water and boiled, the oil collects at the top and is ladled away; or the kernel is steamed and pressed while hot, the oil is separated leaving the cake. When the oil cools it solidifies into a whitish waxy mass, which is worked into slabs or balls and preserved.

If niches are made into the trunk of the tree a highly aromatic resinous gum exudes, which is used in the preparation of varnishes. It is very inflammable and the powdered gum is used in the manufacture of pyrotechnics. A similar gummy resin is extracted from the peel of the fruit.

The kernel oil is sweet and edible and melts at low heat and is extensively used for culinary purposes. Its digestibility is much less than that of liquid oils, of vegetable or animal origin and its absorption also less complete. The oil is used extensively in the manufacture of vegetable oil soaps.

The oil cake contains 1·13 p.c. Nitrogen, 0·21 p.c. Phosphates and 0·04 p.c. potash and is used mostly as manure for plants. It is not used as food for cattle.

Unrefined vegetable oils turn rancid soon and develop a high acid content, sometimes as much as 10 p.c. Fresh vegetable oil under the action of sunlight gets charged with carotene and Vitamin A, which are lost in refined oils. Solid oils as we said, are difficult of digestion and their absorption is only 15 to 20 p.c. To the poorer labouring classes who cannot afford to get milk or ghee, vegetable

minal plethora, the result of habitually eating too much and taking too little exercise, that benefits have been obtained from such a course of treatment, but it is also useful in some cases of chronic Bronchial Catarrh.

Grapes contain very small quantities of Vitamin A and Vitamin C and traces of Vitamin B_1. A kind of drink —Mostelle—an unfermented grape juice prepared by pasteurisation—contains about 25 p.c. grape sugar and forms a useful beverage in the hot weather and in fevers.

The "food" fruits on the other hand are not to be despised as sources of real nutriment. Of this group the banana is a very good example.

Bananas (Musa paradisiaca—Nendrangai), or fruit of the Paradise as its vernacular name also implies. In the fresh state the fruit contains a fair amount of carbohydrates (36·4 p.c.) and an appreciable amount of protein (1·33 p.c.) as well; while bananas dried in the sun and sprinkled with crystal sugar to preserve them better, compare favourably with dried figs in nutritive value and are a pleasant substitute for them as dessert. Banana fruits contain only a trace of Vitamin A, Vitamin B_1 and Vitamin C and very little mineral salts.

In the ordinary form, however, the banana is too bulky to be able to serve as the main constituent of a healthy diet, containing as it does about 65 p.c. of water. Assuming that an average specimen weighs about 5 oz. without the peel, it would require about 25 fruits to yield the amount of energy required daily, and nearly 50 fruits to supply the daily requisite amount of protein. No wonder, then, that in tropical countries where the banana is largely eaten the inhabitants are apt to show an undue abdominal development.

The unripe banana is dried and used to produce banana meal or flour, which has the following composition. For comparison the composition of wheat flour is also given alongside below:

		Banana Flour	Wheat Flour
Protein	..	4·0 p.c.	7·9 p.c.
Fat	..	0·5 p.c.	1·4 p.c.
Carbohydrate	..	80·0 p.c.	76·4 p.c.

plant does not require particular care and its cultivation deserves to be encouraged.

Peaches (Amygdalis Persica) contain about 7·6 p. c. of Carbohydrates, very little proteins, and only traces of Iron salts and traces of Vitamin A and Vitamin C.

Pears. English Pears *(Pyrus ochras)* are mealy and sweet. The country variety (*Pyrus communis*) contain a lot of fibre. Both varieties contain about 12 to 14 p.c. of Carbohydrate and small quantities of Vitamin A, Vitamin B_1 and Vitamin C.

Pears (Avocado)—Aliget—Butter-fruit *(Persea drymifolia)* is the only edible fruit containing a large percentage of fat, as much as 23 p.c.; but it contains very little Carbohydrates and traces only of Vitamin C. The fruit has just been introduced into Southern India, (Coorg) and the Nilgiris (Coonoor).

Pine apple (Ananas Sativus) is a juicy fruit containing a fair amount of Vitamin A and Vitamin C and about 12 to 15 p.c. Carbohydrate but only trace of protein. Pine apple is also a tropical fruit introduced into India first by the Dutch settlers about beginning of the 16th Century. The Kew and the Mauritius variety are now extensively grown in Southern India. They are crisp and tasty and have a nice flavour and are fibreless. Pine apple preserves and syrups are common beverages in the hot weather.

Pine apple is a gentle stimulant of the liver and is usually recommended for chronic cough of some variety.

Plantains (Musa sapiens). There are many varieties of this fruit grown in India and each has its own peculiar flavour. They are all sweet when ripe, fairly rich in Vitamin A and Vitamin C. Taken as dessert after food the ripe plantain is a good laxative and is recommended in habitual constipation.

Plums (Prunus domestica). The yellow variety contain a fair amount of Vitamin A and Vitamin B_1 and only trace of Vitamin C.

Pomegranate (Punica granatum) is slightly astringent in action and is a good food in chronic diarrhöea. The sweet variety contains about 15 p.c. of sugar, trace of protein and a small amount of Vitamin C.

G. CONDIMENTS AND SPICES

Are mostly flavouring agents; although devoid of proper nutriment they have a high caloric value.

Asafetida (Ferula fetida, F. narthex) is the gummy exudation (resin) obtained by incision from the bark of the tree; it is miscible with water making a whitish emulsion. Has highly carminative and antispasmodic properties and contains much Iron and Ca.

Cardamoms (Elettaria cardamomum)—elakki—is generally added to sweets or drinks as a flavouring agent.

Chillis (green and dry) *(Capsicum)* are very pungent especially the small variety (*Capsicum minimum*) and contains a large quantity of Vitamin A and Vitamin C.

[What is known as *Paprika* is a variety of chillies (*Capsicum annuum*) cultivated largely in Europe (Spain, Italy and Hungary). It is said to contain nearly 4 times the amount of Vitamin C as is contained in an equal weight of orange pulp].

Cloves (Eugenia caryophyllata) is also a powerful aromatic and forms a constituent of the well known compound *Gharam masaala.*

Coriander (Coriandram sativum) also contains Fe and Ca and large quantity of Vitamin A.

Cumin Seeds (jeera) (Cumium cyminum) are powerful carminative and diuretic. Contain a fair amount of Ca, Fe and Vitamin A.

Fenugreek Seeds (Menthe) Contains the same principles and constituents as cumin seeds.

Cinnamon (dalchini) is said to have a large proportion of Fe and Ca, is a powerful carminative and astringent.

Ginger (Zengiber officinalis) is powerful carminative, diuretic and liver stimulant and its juice is a good remedy for jaundice.

Mace (Myristica fragrans) is from nutmeg, contains an aromatic principle having slight intoxicating properties. It is a powerful metabolic stimulant and has a high caloric value.

Mustard (Brassica juncea) is a useful condiment having a high caloric value. When ground into a paste with

lithium. Mineral waters are medicated waters and useful in the treatment of chronic diseases like Rheumatism, gout, dyspepsia, constipation and some varieties of skin disease.

Hot mineral springs mostly contain sulphur dioxide in addition to mineral salts. These springs are especially suited for the treatment of obesity, gout, constipation and skin disease.

[A hot sulphur-spring having these advantages is situated at Vajrabhai or Vajradevi, 20 miles from Thana, Bombay. The Author visited the place in July 1937; even at that part of the year when rains usually set in on the west coast of India the water was hot enough and in some parts of the spring-bed the water is said to be nearing the boiling point].

What is known as "balneo-therapy" or Spa-treatment is simply this. A Spa is a health-resort having natural springs containing various minerals dissolved in them. Spa-treatment consists in the therapeutic use of these waters by internal use, by baths, douches etc., combined with massage, exercise, climate, diet and general regime. The effects produced by spa-treatment are both physiological and psychical brought about by change of scene and environment, removal from cares of business, family and other worries, recreation and diversion of various sorts. Defective development, chronic inflammations, disorders of the stomach, liver and bowels, toxaemia, gout, rheumatism, mental break-down, high blood-pressure, obesity, diabetes, over-fatigue and brain-fatigue requiring appropriate holiday and recreation are the usual conditions that improve by spa-treatment, infact any conditions of ill-health, which mainly account for the invalidity and disability of modern life.

In most of these spas there are medical organisations resembling those of hospitals providing appropriate treatment for early and advanced cases.

4. *Mineral water* containing CO_2 in solution is, apart from its pleasant taste undoubtedly an aid to digestion. Indeed it may be said that mineral waters of this type stand alone in this respect among beverages, as they pro-

after the Saint as the Budangiri or Baba Budan Hills. Coffee seeds were therefore first named Budnibeenz (the beans or berries of the Baba Budan Hills) and still retain the name in some parts of Southern India.

It is said, however, that the name "boun" is still applied to coffee in Abyssinia, the original home of the bean.

The coffee berries are roasted and ground into fine powder which is used to make the infusion—the coffee we drink. French coffee usually contains about 40 to 70 p.c. sometimes of chicory mixed with it. (Chicory is the root of the wild endive, kilndried and powdered; the process of drying converts part of the sugar contained in chicory into caramel—a kind of burnt sugar having good flavour and giving the infusion a golden yellow colour). There is no reason to believe that chicory is injurious to health, but its cheapness is a great temptation to use it as an adulterant, a practice which it is said, has tended to discourage the consumption of coffee in certain countries.

The active principle of coffee, we saw, is caffeine, chemically and physiologically identical with theine.

Good coffee is one that is strong and hot; it is prepared by using at least 2 oz. of the powder to a pint of hot water.

Freshly roasted beans retain their flavour only for a short time. The water should be just boiling as in the preparation of tea so as not to dispel all the air contained in it, and the infusion may be prepared in a porcelain, or enamel jug or percolater. Cafe au lait (coffee with milk) contains mostly milk with a dash of black coffee.

* * * * *

The Cocoa plant is the Theobroma Cacao, the fruit of which resembles the cucumber when ripe and contains a pulp in which are embedded bean-shaped seeds. From the roasted beans cocoa is prepared. "Cocoa" was originally "Cacao", but the name got changed with lapse of time into "Cocoa" and has no connection whatsoever with our cocoanut.

The cocoa plant seems to have been introduced into Europe from Mexico by the Spaniards in the 16th Century. Although, therefore, introduced into Europe much

occasions where hot food should be constantly in readiness.

Cooking utensils made of copper or brass should be tin-lined as otherwise any acid in the food such as tamarind, buttermilk may easily act on the metal and produce copper poisoning through eating such food.

PREPARATION OF FOOD AND ITS EVOLUTION

We have seen that the heat applied in cooking food bursting the cells and softening the tissues so as to make it easier to chew is an important aid to digesting raw meat or raw vegetables. It would not be indeed impossible for man to live on uncooked food, and perhaps the nearest approach to this is found among certain aboriginal tribes of the Coral Islands of the Pacific, for example, where raw fish and raw cocoanut form the main part of their diet. Others, such as the wandering tribes of the Australian deserts do eat insects, shellfish, reptiles etc., raw as they find them. The Brazilian forestmen have been known to imitate the ant-bear by poking a stick into the ant-hill letting the ants crawl up along the stick into their mouths.

These practices may ordinarily shock civilised beings, but even the highest of them have no scruples to eat oysters or cheese-mites raw, and to this they happen to be accustomed.

But even these rude tribes know how to cook; they had known the use of fire for house-warming and gradually began to apply its use to cooking food. Evidently they must have discovered that cooking softened the animal or vegetable foods making them easier to chew. Indeed the definition that man is a "cooking animal" has no proved exception, ancient or modern; and all civilised nations cook almost every article of food with the exception of nuts and fruits, which they eat raw being more pleasing to the taste.

Eating raw meat or fish has been looked upon as a sign of low culture. The Eskimo is so-called because he is a "raw flesh eater" which the word means in French.

The most primitive ways of cooking is seen even now among the savage tribes, who boil their meat or fish on

be the result of external conditions, and such diseases are called "acquired" or "environmental" diseases, as opposed to inherited or hereditary diseases.

The chief causes of Acquired diseases are:

Mechanical injuries, extremes of heat and cold, alterations in the atmospheric pressure as in high or low altitudes, electric shocks, unclean water, defective food or defective digestion and assimilation of food, starvation, lack of fresh air and sunlight, fatigue and want of rest, mineral and organic poisons and parasitic organisms. The last is the commonest cause of atleast 90 p.c. of diseases of the Tropics.

Disease may be acquired during *intra-uterine* life such as Smallpox, Tuberculosis, Syphilis—the infective agent passing from the mother to the foetus by the blood stream.

* * * * *

The complete healthy life of a cell consists in the perfect performance of all its functions; for this it is necessary not only that its structure and vital energy should be normal but that the nutriment, which it receives should be sufficient and suitable, and that its surrounding conditions—Pressure, Temperature and connection with other tissues—should be normal. Failure in any one of these will lead to defective action, or even death of the cells with resulting disease of the organism as a whole.

In the case of a unicellular organism any change in the external conditions acting on it will effect every particle of its substance and modify all its functions; and any disease affecting such an organism can, therefore, be called a "general" disease. But in the case of the higher animals characterised by multiplicity of cells and differentiation and specialisation of functions any abnormal conditions may act on a group of cells and disturb their functions only without affecting the function of other groups of cells. We thus get what is known as a *"local"* disease. But it is highly improbable in higher animals for any local disease to exist without some disturbances of the system as a whole, though this disturbance may be so slight as to escape notice.

A disease is referred to an organ or tissue during life

such as Relapsing Fever, Trench Fever and Typhus. In these cases the transmission is due to infected lice from a patient migrating on to healthy people. The louse on a patient suffering from, say Relapsing Fever, gets infected with the spirochaetes, which enter the body-cavity (of the louse) and get into its circulation. There is a tendency on the part of the lice to leave a person suffering from fever, and they get on others sleeping in the same room. As the result of the irritation due to the louse-bite the healthy person starts scratching and thereby may crush the infected louse. The body fluid of the infected louse is full of spirochaetes and the infection is brought about by the inoculation of the body fluid of the louse into the abrasions of the skin caused by scratching. The bite of the infected louse by itself cannot produce the infection, and if the man abstains from scratching he may entirely escape infection.

In the case of the other louse-borne diseases like Typhus and Trench Fever the method of transmission is much the same.

Prevention of louse-borne diseases is effected by "de-lousing" the population. Personal cleanliness, frequent bathing with soap and water and constant change of clothes are useful precautions. In the case of the infected persons boiling or steaming of clothes and underwear, a thorough shave and treating the head and other parts of the body with kerosene or petrol are the most effective remedies. In mild cases application of vinegar to the head loosens the hold of the nits; application of simple oil to the head kills the adult lice by blocking their breathing tubes.

The following is a useful application for "de-lousing":

Kerosene oil	16 ounces.
Sunlight soap	One bar cut into flakes.
Oil of Citronella	1 dram.
Water to	32 ounces.

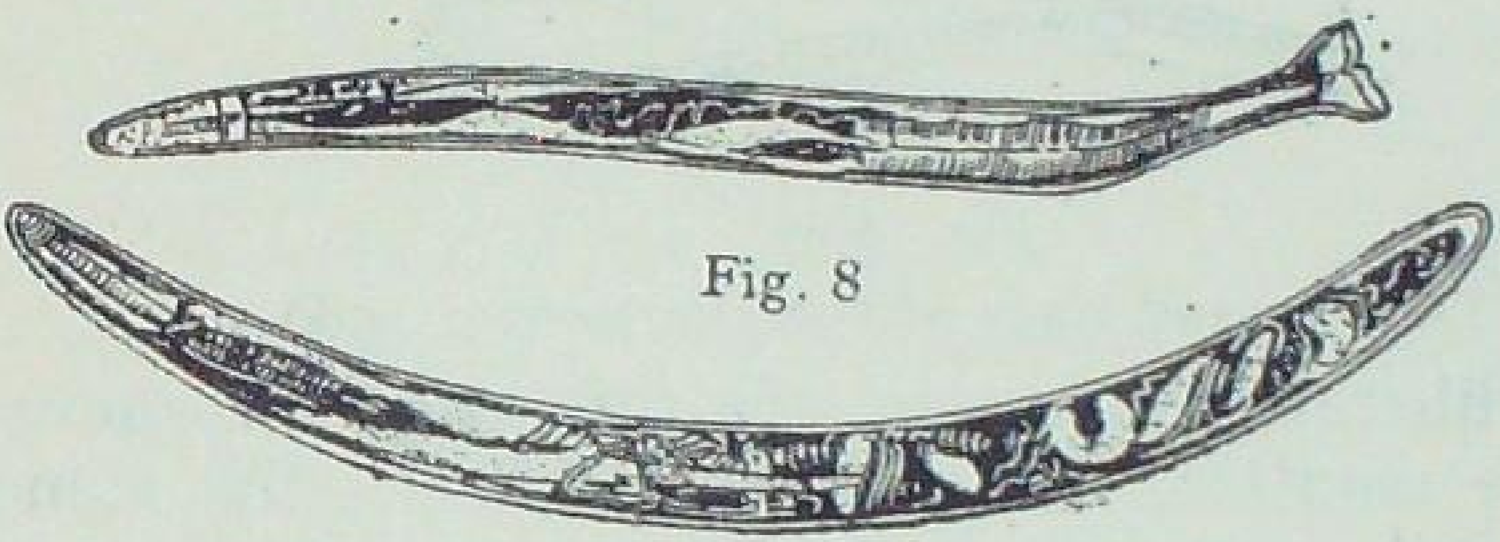
Dissolve with the aid of heat and use diluted 1 in 3. (Madras General Hospital formula).

B. THE ACARI (Itch mites)

These belong to the spider-class and are tortoise-shaped. They are about 1|50 of an inch long. *(Fig. 6)*.

stomach, but can do so in the intestine once they pass the stomach. They must accordingly be passed per annum of the host and the host reinfected by the mouth before a new generation can develop in cases where any continuous infection is maintained.

The thread worms inhabit the large intestine, where they may exist in myriads. They are found mainly in children and are probably derived from infected vegetables and fruits especially grown on human excreta as manure. Their principal effects are those of local irritation, producing a large quantity of slimy mucus, some of which is passed with the stools; they may also lead to prolapse of the anus, and anuresis. Certain reflex effects, like rest-



Ankylostoma duodenale (Hookworm) Adult ×30

lessness and convulsions are said to be produced by their irritation at the anus. They make their way through the anus at night causing intolerable itching and may be found in the vagina, on the buttocks and on the bedsheet. The itching at the anus leads to scratching and to the deposition of ova under the finger nails; and the additional itching at the mouth or the nares (which is also a common effect of these worms) leads to the continual transit of the fingers between the mouth and anus during sleep and accounts for the frequency of autoinfection in the case of children.

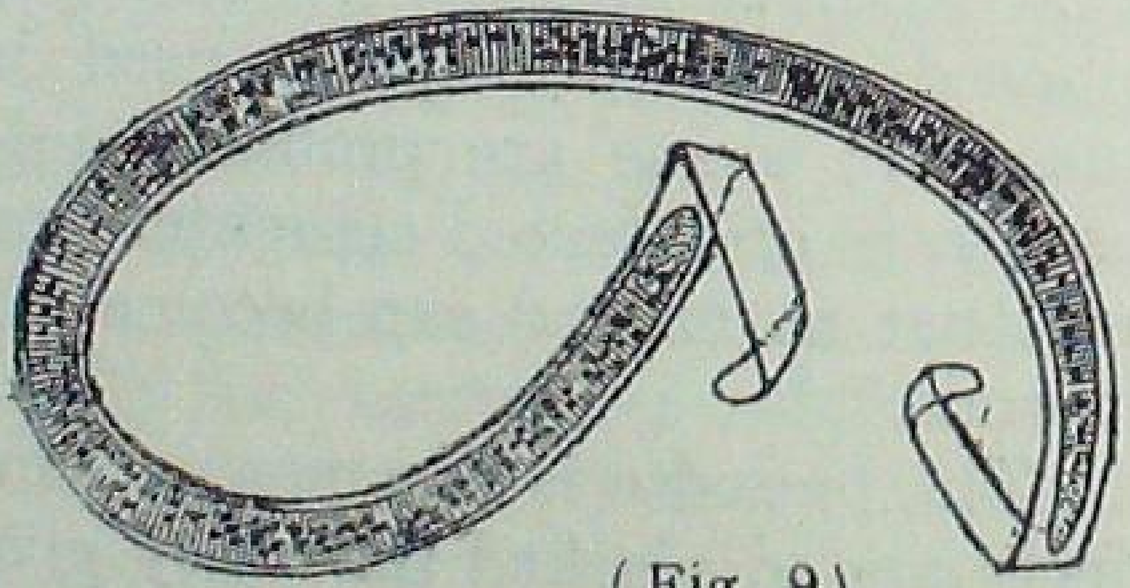
(3) *Hookworms. (Ankylostoma duodenale; uncinaria duodenale)*. This parasite is common in all Tropical and subtropical countries as warmth and moisture are specially necessary for their propagation. It is sometimes present in colder climates such as the deep mines of Cornwall and Belgium in which high temperature, moisture and bad sanitation occur.

The female worms are rather more than ½ inch and

derness giving rise in addition to high fever to symptoms of aphonia (voicelessness), dyspnoea (difficulty of breathing) and dysphagia (difficulty in swallowing) and other serious symptoms depending upon the special muscles involved.

(5) *Filaria.* These are long threadlike worms. In Tropical countries many forms are parasitic in man; of greatest interest is a group of filariae known as the Filaria Sanguinis Hominis, because the embryos (microfilariae) are found in the human blood, and of this group the Filaria Sanguinis Hominis Nocturna is the best known member. The embryonic forms circulate in the blood and the mature forms lie in the tissues, lymphatics and blood vessels. The adult form of this Filaria Nocturna is known as F. Bancrofti. The adult female has the appearance of a white thread—that is how the name Filaria was derived—and is 3½ inches long and has a diameter about 1|100 of an inch; the male is much smaller and less frequently found. After the death *of the host* these parasites are generally found lodged in the main lymph channels, but may be found anywhere.

The embryos or larvae (microfilariae) *(Fig. 9)* found in the blood are about 1|90 inch long and 1|3000 in diameter, that is nearly the diameter of a red blood cell, so that they are able to pass through the smallest capillaries. The embryo is provided with a fine sheath which it does not completely fill and in which it can move backwards and forwards.

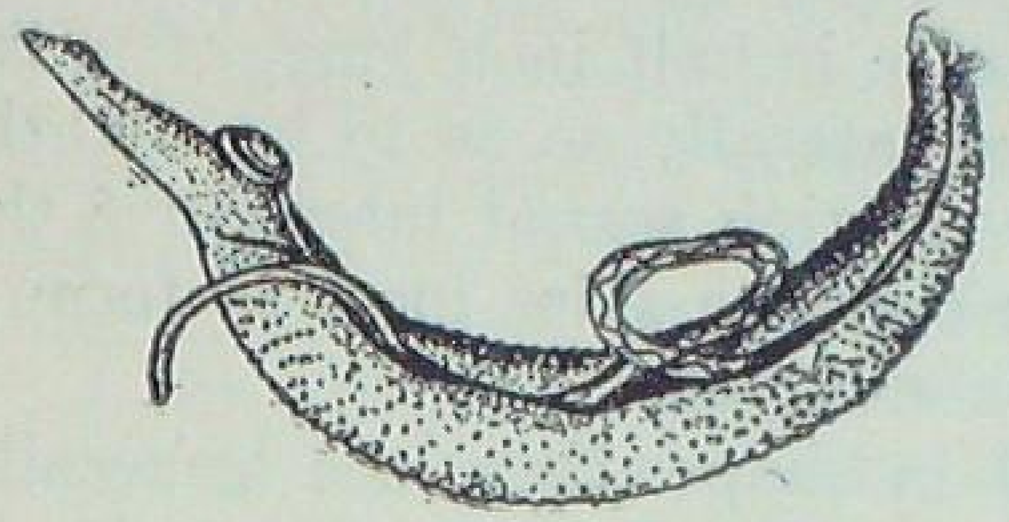


(Fig. 9)

Microfilaria Bancrofti
(Filarial embryo in the human blood. Highly magnified)

The embryos are only found in the superficial blood during sleeping hours—hence the name "nocturna". They

wells and tanks which are approached by steps are the greatest source of infection. No one should be allowed to drink water from there but from draw-wells which are surrounded by a proper parapet to prevent water that has become infected from running back into them. The best method is to introduce pumps for drawing water instead of buckets. Boiling all water before use, after straining if necessary, is the best means of prevention.



(Fig. 10)
Schistosoma Bilharzia haematobium. Male and female in copulation X 20.

(6) *Schistosomidae* (Flukes) These belong to the class of nematodae (roundworms). The adults of these flukes are found in pairs in the veins of the portal system and other abdominal veins. (*Fig. 10*). The females produce numerous eggs, which escape from the human body in the urine or the faeces. If the ova reach water free swimming embryos escape from the eggs and attack certain fresh water snails by burrowing into their tissues, in whose bodies they undergo a cycle of development and escape from them in the water, from where they burrow through the skin of persons wading or bathing in the water; they then make their way to the portal system of man where they develop into adult worms and thus complete their life-cycle in man.

Three species of these flukes are parasitic in man: (1) Schistosomum Haematobium of Bilharz, is chiefly found in Egypt, Arabia and South Africa and causes wide-spread epidemics of haematuria (presence of blood in the urine); the effects of this parasite are to produce pain in the region of the urinary bladder and perineum with dysuria (painful micturition). Ova may be found in urine, which frequently contains blood. Sometimes the ova may lead to formation of blood clot in the bladder,

rise to more than 16 millions. They therefore do multiply rapidly in the human body where the blood and the tissue-fluids afford the proper nutriment and the optimum temperature of the body-heat.

Other forms of organisms are smaller and are ultra-microscopic and filtrable, that is, capable of passing through the finest pores of a Chamberland filter being so minute; such are the germs of common catarrh, mumps, influenza, small-pox, measles and rabies.

Certain bacteria, the so-called higher bacteria come midway between the lower bacteria and the fungi and exhibit specific reproductive structures, thus suggesting that they are probably closely related to vegetable life.

Some forms of bacteria, such as those of anthrax and tetanus, both being bacilli, have the power of protracted survival under unfavourable external conditions, like sunlight, heat and desiccation.

It is important to bear in mind that for the existence of many of the pathogenic (disease-producing) bacteria some animal host is necessary, and except perhaps the resistent spore-bearing forms, they do not survive very long in nature apart from the bodies of animals which they invade.

All bacteria are not pathogenic; and those that are pathogenic cause disturbances of health with the development of lesions which may be localised or scattered throughout the body.

Certain pathogenic organisms like the typhoid bacilli and cholera vibros can be present in the body without manifestation of disease; other bacteria such as Bacillus Coli are normal inhabitants of the intestines; all, however, under certain conditions (to be noted below) become pathogenic, that is, bring about disease.

The popular conception that the presence of bacteria is always associated with disease is erroneous. Human life would have been impossible, as we have seen already, were it not for the innumerable activities of bacteria, which are definitely beneficial; moreover, the bacteria found on the exposed parts of our bodies, such as the

mechanism of the host. Hence there is always a struggle, (and that is what is meant by "reaction") going on between the natural defensive mechanism of the body and the invading organism; the more prompt and efficient the response on the part of the host the better is the outlook of "prognosis" as to his recovery from the disease.

Now, what are the factors that render the host susceptible to the attack of these bacteria? in other words, what are the factors that predispose the host to bacterial infection?

We have seen already—and there is good reason for the belief also—that any agency which interferes with the general health of the host or which damages the tissue of the host will diminish the host's natural power of resistance to infection. Thus fatigue, overwork and want of rest and sleep, chronic alcoholism etc., cause a general deterioration of health; injudicious diet predisposes to disturbances of the alimentary canal and increases the susceptibility to bacterial infection. Injury mechanically opens a road into the tissues and creates a nidus for the growth and multiplication of the invading organisms. Tetanus bacilli do produce disease only when there is an open wound in the skin or the mucous membrane or the tissues.

INFECTION

We mentioned above that 50 p.c. of all diseases are caused by external animate agents, such as bacteria, yeasts, fungi, spirochaetes, filtrable viruses, protozoa, and animal parasites. So it is certain that a large proportion of all instances of disease are infectious in nature, certainly well above the 50 p.c. which we attributed to this source. In fact, Manson has shown that more than 90 p.c. of all Tropical diseases are the result of infection by microbes and parasites.

An infection,—as implied in its Latin origin, *inficere*, meaning to stain or contaminate—comprises the entrance into the body of a host, of an alien or foreign living agent and its manifestations there. We have seen already that no infectious disease is spontaneous in origin, and Pasteur in

monest form of production of harm is the formation of certain chemical poisons or Toxins; they are produced during the growth of the micro-organisms, or may be due to products of disintegration of the bacterial cells or disintegration of the blood or tissue cells themselves. The nature of these toxins varies remarkably with the nature of the Bacteria that give rise to them and their field of operation.

Area involved in an infection. An infection may remain more or less limited to the portal of entry of the microbes *(local infection)*, or it may spread in a variety of ways and to varying extents. Localisation of an infective agent simply means that it is not present in sufficient numbers or virulence to penetrate beyond a limited area, or reciprocally that the defences of the host are sufficient to hold the infective agent in check. This is the case with certain skin infections by low virulent strepto or staphylococci or even with a dangerous organism like the anthrax, which in man may produce only a local malignant pustule without further involvement.

On the other hand with certain microbes like the diphtheria bacillus or tetanus bacillus the infection may remain limited to the area of the portal of entry, but their toxins might spread throughout the body producing the general fatal symptoms of the disease.

Infection might spread by a process of *extension from the margin,* as in Erysipelas; measles is often complicated by Broncho-pneumonia, which in turn may spread by extension to the pleura without affecting the general circulation. But the usual mode of spread of an infection is by the blood or lymph stream as in Pyaemia, syphilis and some form of Tuberculosis (miliary tuberculosis); sometimes the blood stream itself may allow the multiplication of the bacteria, thus involving the valves of the heart and its lining membrane—the condition is known as septicaemia (presence of poison in the blood) or Bacteraemia (presence of bacteria in the blood) and pyaemia (presence of pus-producing germs in the blood).

Typhoid fever is the best illustration of a bacteraemia, where the metastatic foci (spreading centres) are in

generation) of some of the organs does commonly occur and is suggestive of the end of the scene.

There are other numerous infectious agents such as the filtrable viruses of Influenza, Rabies, Cerebrospinal meningitis, which all have a selective action on some of the particular groups of cells, especially of the Brain and the Spinal Cord and their membranous coverings.

Leprosy bacilli have a particular selective action on the sensory nerve-endings of the skin; and the bacterial toxins of tetanus and diphtheria have their selective action on the Central Nervous System.

Complex infections are of two sorts: secondary and mixed infections. In secondary infections one micro-organism follows the action of another owing frequently to lowering of resistance, general or local, produced by the first invasion. Influenza is not infrequently followed by pneumonia, which may be due to any one of the several varieties of microbes, such as the Streptococcus, Pneumococcus or the Influenza bacillus. It is the finding of these secondary invaders that has obscured the causation of many infectious diseases particularly those due to filtrable viruses.

In mixed infections two or more infectious agents are coincidentally present and produce a combined effect, which may be either greater or less than that produced by either alone.

2. RESISTANCE, TOLERANCE AND IMMUNITY.

These terms are often used interchangeably but their exact significance is more precise.

Resistance is a more comprehensive term and applies not only to diseases of infectious origin, but to those produced by physical and chemical inanimate agents.

Tolerance is the term applicable only to natural or increased resistance against inanimate disease-agents. Under conditions of tolerance to physical agents may be mentioned the natural mechanisms in the anatomical construction of the body, which places the more resistant skin outward with its nerve endings to warn us of external injuries, the various reflexes, such as sneezing, coughing

ges) of the blood, and secondly certain Mononuclear cells (macrophages) not only in the blood but in other tissues were the chief agents of defence, as they had phagocytic or devouring properties, that is to say, of ingesting and destroying bacteria and other foreign cells. In his mind the microphages (polymorphos) were primarily those most concerned in the acute bacterial infections; and the macrophages (mononuclears) played their role largely in the disposal of foreign animal cells, which, incidentally included polymorphos also that had succumbed in their struggle with bacteria. But in recent years we have come to regard the macrophages, the distribution of which in the body is much wider than at first supposed, as even more important than the microphages. Their importance is evident not only in protozoan or animal cell-infections, but also in the acute bacterial infections, where they seem to serve as the second line of defence, in instances where the microphages are inefficient; in other words macrophages can dispose of bacteria that are too virulent to be checked by the microphages.

The macrophages, or the mononuclear leucocytes have three main distributions in the human body, namely in the connective tissues, in the endothelial capillaries and to a less extent in the bloodstream, and there is evidence that one form present in any of these areas may be transformed into any other varieties. Where these cells are collected, as they are in the granulation tissue of a healing ulcer, they not only serve to protect such tissue locally from even virulent agents, but they can actually move within certain limits in response to an infection in some other part, as for example, from one pleural cavity to another.

Metchnikoff's conception of production of immunity has been universally accepted not only in its essentials but in details too. It will be seen that the part played by the more recently recognised Reticulo-Endothelial-cell-system tends to strengthen the significance of the phagocytic theory.

2. *Humoral theory of Immunity.* Soon after Metchnikoff's theory of phagocytosis was outlined various

causes vomiting; and an undigested fermenting mass of food in the stomach is got rid of by vomiting or purging. The virus of cholera gaining entrance into the alimentary canal sets up vomiting and purging with large watery stools, indicating the means Nature adopts to wash out the irritating element.

Endless are the physiological actions coming into play both in health and disease, all calculated towards ensuring safety to the body. A few more examples may be given: such as the clotting of blood which helps in sealing the cut ends of a blood vessel; or the secretion of a large amount of fibrinous material in and around a leakage in the bowels as in the case of a perforating typhoid ulcer, with the object of either sealing it or shutting it off from infecting the general peritoneal cavity; or compensatory hypertrophy of the heart in case of valvular disease of the heart etc. A foreign body lodged in the tissues sets up inflammation and suppuration and the body is thrown out when the pus is discharged; or as sometimes happens in the case of an aseptic body like a fired bullet lodged in the body, Nature attempts to enclose it in a fibrous capsule (encystment) formed around it. Often a tuberculous cavity in the lung heals by the formation of such a fibrous capsule all round it so as to shut it off from the healthy portion of the lung and save the latter from infection.

Next we have to take into consideration the natural protection afforded by the anatomical formation of various cavities of the body with their lining of tough serous membranes, in which the organs are mostly lodged for their safety. These are the bony cavities of the skull and spinal canal lined with the meninges in which are placed the most vital organs, the Brain and Spinal cord; the special sense organs, the Eye and the Ear, are likewise protected from violence from man's natural weapon of offence or defence, *viz.*, the first. The Lungs and the Heart are enclosed in the pleurae and the pericardium respectively and placed securely in the thoracic cavity—an elastic casing formed by the spine behind and the breast-plate in front, the ribs at the sides covered with thick layers of muscles of the chest and back and the elastic thick, mus-

pox. When the microbes exist in a free state in the blood they may be transmitted by bloodsucking insects, as for example, the transmission of the malarial parasite by the mosquito.

Material carrying the germs of disease may be conveyed from person to person by direct contact; this, no doubt is the chief method, the greatest number of infections being probably brought about by the introduction of germs into the mouth and respiratory passages by the fingers, or by food and drink.

The public drinking cup, the dirty lavatory, careless spitting and coughing in public places and the almost universal practice of touching the lips with the fingers contribute largely to transmission of disease. The necessary toilet procedures, the handkerchief, dirty hands—are all sources of danger not only to the individual but to other people as well. Only absolute cleanliness can protect from contact-infection. Formerly it was thought that articles used by a diseased individual might retain their infectious nature for some time following use. This is now considered to be rather an uncommon means of infection, direct or indirect contact soon after the organism has been released being the much more usual.

FULL MANY A GERM BETWIXT CUP AND LIP

There is no doubt that germs can be communicated through saliva exchange in every insanitary restaurant or bar room. In the autumn of 1918 when the post-war 'Flu' epidemic was at its highest two officers of the Army Medical Corps, Lynch and Cumming, observed that some of the troops in the camps ate from tableware or utensils which had been boiled, while others stood in line to rinse their mass kits in a common tub of dirty lukewarm water.

These Doctors gathered statistics and it was found that 25 p.c. of these latter caught the disease, while of those whose mass-kits were boiled only 5% caught the infection; of course other factors may have been involved, but there seemed to be a definite connection between poorly washed mass-kits and the spread of 'Flu.'

There are thousands of small eating and drinking

housed. At present it is thought to be more efficient to destroy or disinfect everything used by the patient immediately after use and to take extra care in the methods of disposal of all excreta; the nurse is also warned to be scrupulously clean and to be especially careful to wash her hands after touching the patient or any object which may be contaminated.

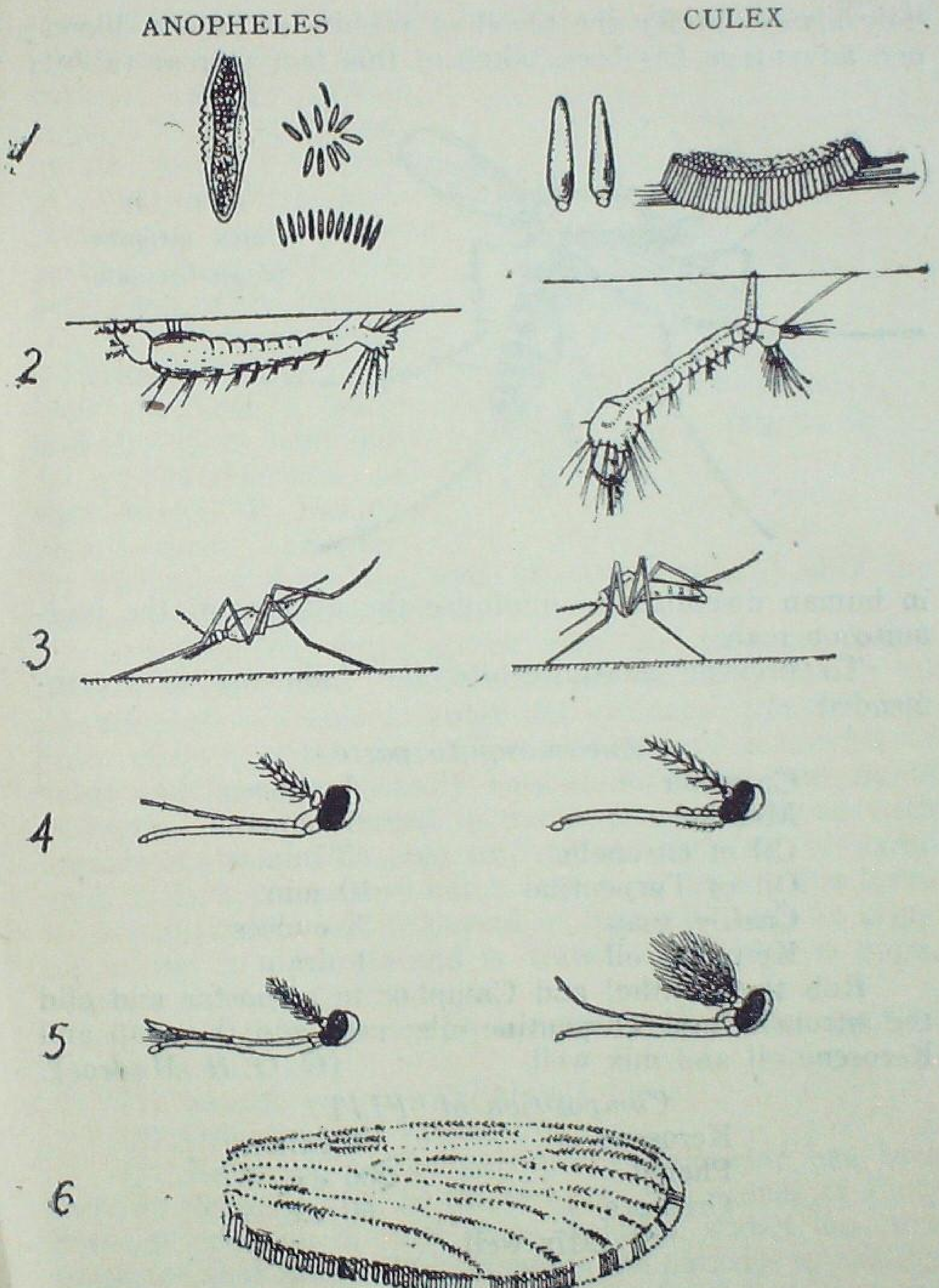
Inoculation is another means of preventing disease. The principles underlying the process have been discussed already under Immunity. Typhoid fever and small-pox, cholera and plague are examples of diseases in which inoculation as a prophylactic measure is of the greatest value.

The fact that certain varieties of mosquitoes carry the organisms of Malaria, Filariasis, Yellow fever, Dengue etc., makes it incumbent upon a community to destroy these insects. The flea which infests rats, may bite a person and infect him with the organisms of plague. Rats are, therefore, dangerous and should be destroyed.

IV. INSECTS IN RELATION TO DISEASE

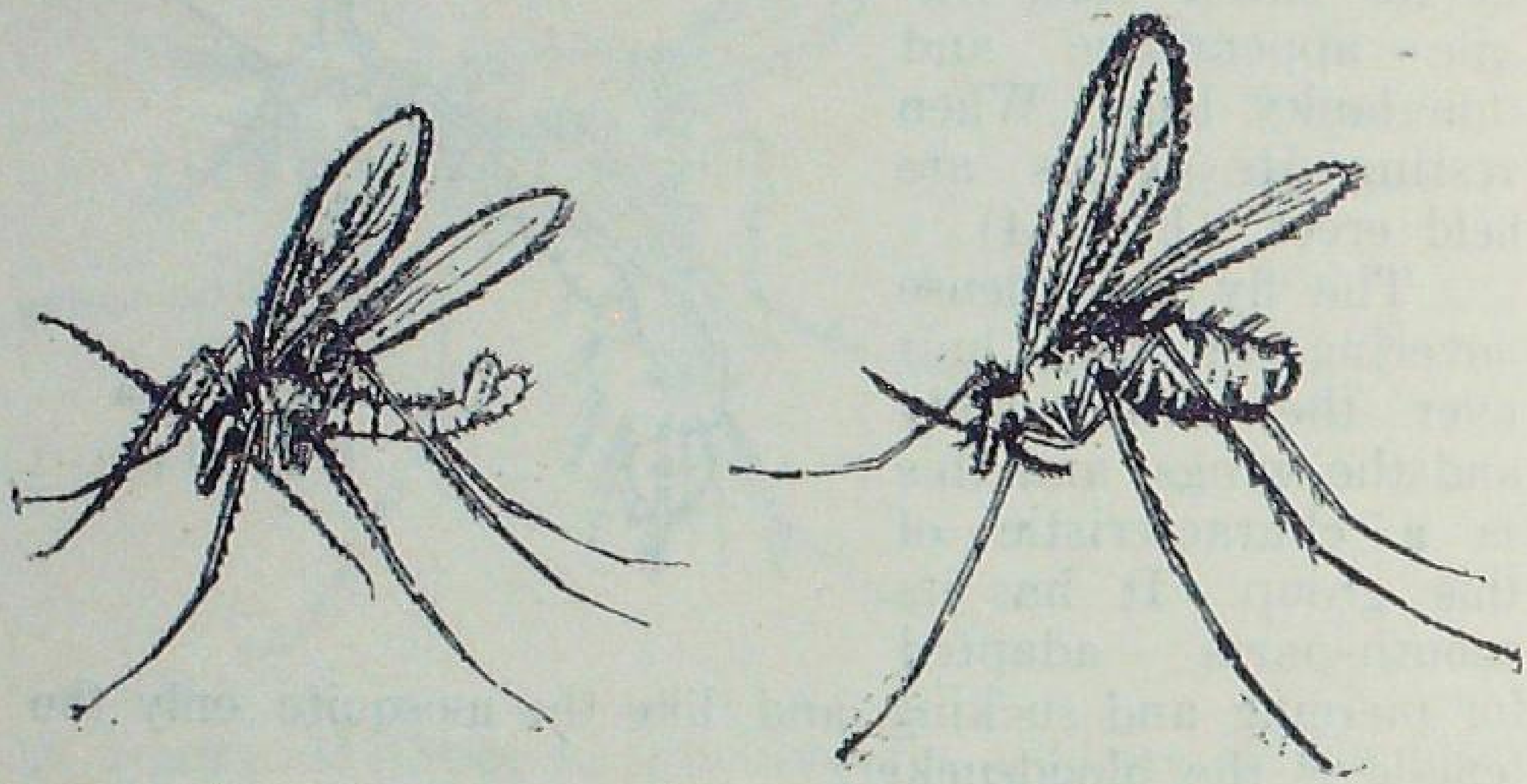
The relation that exists between insects and disease is somewhat varied. In some cases it is a purely accidental and mechanical one; such a condition exists, for example, when a fly picks up typhoid or cholera germs on its feet from a contaminated heap of decomposing matter or from the privy and transfers them on to our food; but where the flea transmits plague from rat to man the role this insect plays is a more active one, since it sucks the plague germ out with the blood of the rat and later injects it into the blood of man. This too is, however, an essentially mechanical phenomenon, and so it can be said that in general the spread of bacterial parasites by insects is accomplished in this mechanical fashion.

In other diseases such as malarial fever we find the picture a different one. The parasite of this disease is a protozoon and has to pass through certain stages of complex development in the body of the intermediate host, the mosquito, before it is injected by the mosquito into another host, man or animal. For this "biological trans-



1. Eggs. 2. Larva. 3. Attitude or Resting posture.
4. Head of Female. 5. Head of the male.
6. Wing of the anopheles.
(Fig. 12.)

The sandfly is a vicious blood-sucker and its bite is, we said, very painful. As these flies are the transmitters of the various diseases mentioned above care should be taken to avoid them. In areas infested with sandflies it



(Fig. 14)

Sandfly (male) Sandfly (female)

would be necessary to use a mosquito net with a much finer mesh than the ordinary type.

Certain drugs and applications to the body have been known to repel the sandfly. Such a mixture as the following suggested by Crawford is a useful one. It consists of:

Ol. Anisi....one dram
Ol. Eucalypti....one dram
Ol. Terebinthinae....half dram
Boric ointment...one ounce.
Mix well.

This ointment smeared lightly over the exposed parts of the body acts as a good repellent and antiseptic.

C. THE COMMON HOUSE-FLY (Fig. 15)

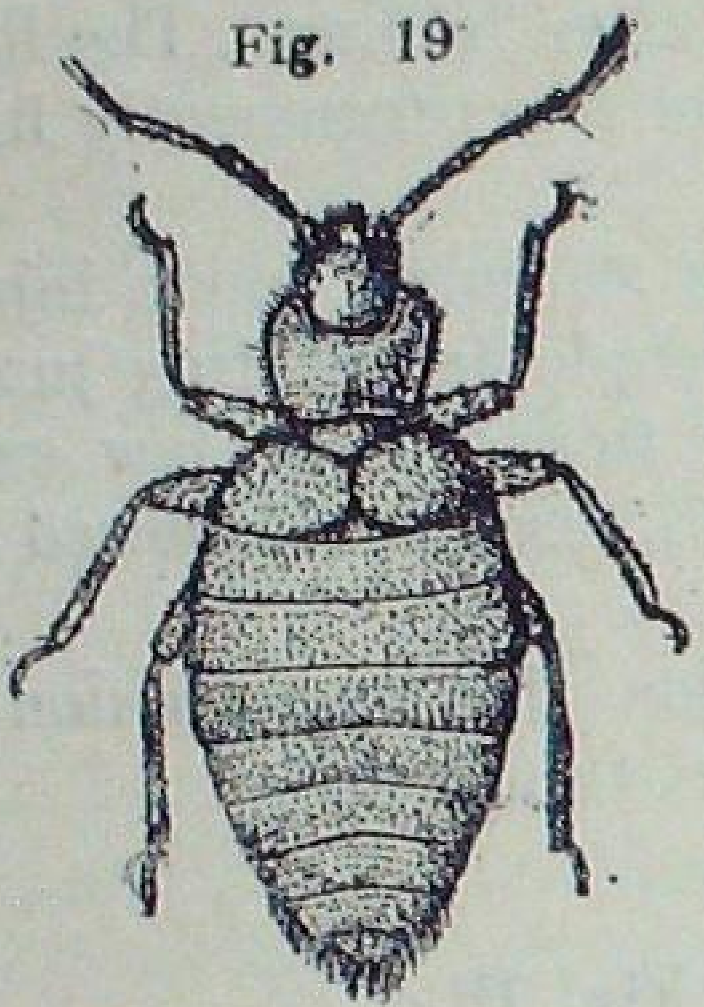
House-flies belong to the family Muscidae, of which there are several varieties: the grey or house-fly (known as Musca domestica), the biting stable-fly, the green bottle fly (Chrysomyia) and the blue bottle fly (Calliphora). They are all Diptera (having two pairs of wings). Their

Plague is transmitted by a process very different from that by which other insects transmit insect-borne diseases. Normally the plague bacillus (Pasteurella pestis) causes the disease in rats in an epidemic form at certain times of the year. The infection of rats with plague is a natural one and the spread of it to man is only a side-issue and largely accidental. In the infected rat suffering from plague, the plague bacilli are present in large numbers in the blood stream. Every drop of blood of the infected rat contains large number of bacilli and any flea that feeds on such infected rats gets some of these bacilli into its stomach. In the case of fleas belonging to the species, Xenopsylla cheopis, the stomach and proventricular region seem to be very favourable for the development of the plague bacillus and it multiplies prolifically and with great rapidity. As a result of such multiplication the stomach of the flea is within a very short of time filled with a dense mass of plague bacilli, and this mass blocks up the front part of the gut. Fleas with their guts blocked in this manner by a plug of plague bacilli are incapable of taking any more food with the result that the flea develops a great appetite and thirst. This makes the flea attempt to bite with much avidity. When a flea with a blocked gut tries to feed on a healthy rat or on man a small amount of blood is drawn up into the pharynx as a result of the sucking action of the pharyngeal pump, but this blood is prevented from getting into the stomach owing to the blocking in the region of the proventriculus. When, finally, the flea stops its futile efforts to feed, the blood in its pharynx gets back into the puncture (wound) in the bitten animal as a result of the recoil of the pharyngeal pump. This blood which is sent back into the wound is contaminated as the result of contact with the mass of plague bacilli in the fore part of the gut of the flea.

The inoculation of the blood contaminated with plague bacilli into the wound in the manner described above brings about the disease, plague.

The chance of infection of healthy rats as also of man increases in proportion to the incidence of fleas on rats

Fig. 19



Cimex Rotundatus

Bed-bug × 10

generally nocturnal in habit may try to feed at any time of the day or night. Bugs abound in dirty houses and take shelter in beds and furniture and crevices in walls. Common in railway carriages, tram cars and buses and in places where people resort in large numbers.

The bed-bug inflicts a painful bite, but so far as our present knowledge goes it has not been shown to transmit any human disease, although it has been from time to time suspected to transmit various diseases, and at one time considered to be the vector of Kala-azar and Relapsing fever. It has since been shown that the bed-bug is quite innocuous as regards disease-transmission.

In spite of this fact there can be no justification for tolerating this most disagreeable house-pest. It should be easy to rid a dwelling house of the bed-bug as we know of several very effective destroyers of this insect. Petrol and Kerosene are very effective against both the mature and immature forms and also their eggs if properly used. It is best to inject petrol or kerosene into crevices and corners infested with the bed-bug by means of an oilcan or spraying it with a small hand-sprayer. Petrol is preferable to kerosene as it is more toxic to the bug, and evaporates more readily without leaving any disagreeable smell. Care however should be taken in the spraying of Petrol not to have an open light nearby.

Fumigation with formaldehyde is often resorted to in Railway carriages. Boiling water or superheated steam is useful when the material is not damaged by heat.

Ammonia and menthol do allay the irritation of bug bite, and also Iodine and Hydrogen-peroxide.

PART FOUR

The Expectant Mother and Her Child*

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1. PREGNANCY

Pregnancy is not a *"nine months' disease,"* but only a physiological state and may be regarded as a normal phase of the female life-cycle similar to that of puberty and the menopause; nevertheless it carries a certain liability to disorders characteristic of the condition. The pregnant woman is not immune to the ills to which she has previously been exposed or particularly susceptible, and any latent or quiescent abnormality or chronic disorder is likely to be kindled to renewed activity during pregnancy; moreover, pregnancy stimulates almost every tissue and organ to function at a higher intensity.

Certain changes do occur in the maternal organism as a result of conception. Except during pregnancy the sole function of the mature uterus (womb) is that of menstruation. It usually measures about 2½" in length, 1½" in breadth and ¾" in thickness and weighs 1½ ounces in the nullipara (a woman who has not borne children) but is slightly larger and weighs more in the parous (one who has had pregnancy and delivery) non-pregnant woman. With the advent of pregnancy certain new functions are assumed by the uterus, *viz.*, the protection of the growing embryo, development of a mechanism for its nourishment and hypertrophy or growth of muscular tissue sufficient for expulsion of the embryo at full term (delivery). When full growth is completed as at full term of pregnancy the

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* For a fuller description of the subject read the Author's—"The Expectant Mother & Her Child" pp. 188 cr. Oct.—Illustrated—Price Rs. 2/12. Available at all eminent Booksellers.

more visible when the skin is stretched over them. The dark areola becomes broader and more pigmented—secondary areola, as it is called. The nipples enlarge, become darker, also feebly erectile. Colostrum (thick milky fluid) may be expressed from the nipples, but this usually appears later in pregnancy and may even be absent until the last weeks of pregnancy. The general outline of the breasts follows no regular course. The breasts in multipara (in those who have borne children several times) are more often pendulous than in the primipara except in late pregnancy, when the added weight of the distended tissues causes them to droop often requiring artificial support. Varicocities (tortuousness) of the veins in the vagina and the legs, haemorrhoids or piles (which are also varicose conditions of the veins of the lower part of the rectum) are common in pregnancy. Oedema or dropsy of the feet and legs is common.

Nausea and vomiting of early pregnancy are striking symptoms but are by no means as common as generally believed.

Constipation is the rule in pregnancy and is usually of moderate degree, but patients often think it is a serious matter. The tendency to constipation is mostly due to displacement of the bowels brought about by the gradually enlarging uterus, the relative inactivity of the patient in the later weeks of pregnancy and the probable inefficiency of the power of bearing down due to the presence of the enlarged uterus.

The treatment of constipation in pregnancy should be as simple and mild as will produce a satisfactory action of the bowels, and can be accomplished by including in the diet fruits such as plantains, figs, prunes, papaya etc., course and fibrous vegetables and abundance of fluids such as milk, butter-milk and warm water. Cocoa and coffee or tea are also useful, but cocoa constipates in some cases and much of tea and coffee do especially produce sleeplessness and "bilious" attacks in peculiarly susceptible women. Brown bread is a better food than white bread. Crushed oats or Ragi in some form or other is a good laxative and supplies Fe, Ca and vitamins and good

who spend a great part of the day in bed will be ill prepared for the severe muscular effort required in labour.

Regular exercise in the open air is therefore important for the pregnant woman and should be of the character one is accustomed to. It promotes sleep, helps digestion, keeps the muscles in a healthy tone and encourages a cheerful frame of mind. Most expectant mothers get a fair amount of exercise in looking after their homes, but this though often tiring is scarcely the best form of exercise, and an effort should be made to spend at least an hour or two in the open air. All violent exercises such as tennis, riding, cycling or swimming should be avoided during the last six months. Speaking generally the amount of exercise should be regulated by the woman's own feelings and should always stop short of fatigue. There is no reason why house duties should not be continued till the end of pregnancy, provided the rule regarding over-fatigue is observed; but women employed in factories should give up their work at least 6 weeks before term, so that they may get more intervals for rest and time for outdoor exercise. Frequent change of activity and relaxation from the mere routine phases of living are an excellent tonic.

Violent physical efforts and extraordinary types of bodily strain are attended with an appreciable risk of miscarriage or premature labour.

REST AND SLEEP

While exercise is important a proper amount of rest is even more so. In fact rest is perhaps the most valuable agent in the practice of medicine, and the prenatal period being one of preventive treatment a generous amount of rest fortifies the body against the strain of pregnancy and labour, increases the resistance to infection, prevents toxaemia and gives promise of greater success in nursing the child.

Especially during the latter half of pregnancy at least 2 or 3 hours should be given every afternoon to rest on a couch or bed and if possible in a quiet room; the feet should be raised to the same level as the body and all

Taking a sufficiency of fluids, eating fresh fruit, green vegetables, brown-bread, bran-bread, ragi and wheat chapathis and oatmeal porridge at breakfast, and drinking a glass of hot water immediately before or just after rising in the morning are all laxative in their effects, but pieces of hard orange-skin act as a mechanical stimulus to the bowel. The value of figs, dates, prunes is well-known; and a very good home-made remedy is stewed prunes, and to make them more effective it is a useful plan to infuse some senna leaves in a muslinbag and put them into the pan beside the prunes to be stewed. Castor oil is very useful occasionally and has the advantage that it acts quickly. One or two table-spoonfuls may be taken as a dose; but it is not suitable for constant use as it tends to constipate afterwards. Strong purgatives like Epsom salts are contra-indicated, but Siedlitz powder and fluid Magnesia or Milk of Magnesia are less violent.

URINE

The regular action of the eliminatory organs of the body is of very great importance. If the skin, the kidneys and the bowels do not act sufficiently well, the most serious complications of pregnancy may arise. The pregnant woman should in all cases be warned of the importance of noting a sudden or gradual diminution in the amount of urine which is passed daily. Frequent examination of the urine is therefore essential, as very valuable information may be obtained which may enable us to forestall such dangerous complications, as eclampsia, hyperemesis etc. If the urine is normal, it should be examined at least once a month, and if albumen is present it should be examined weekly or even daily. If the kidneys do not act sufficiently the amount of fluid intake such as barley water and plain water should be increased. The action of the skin should be encouraged by hot baths, warm clothes and in some cases by the administration of Apenta, Apollinaris, saline purgatives like Mag. sulph., Soda sulph. etc.

CLOTHING

The amount and kind of clothing depend so much upon climate and season that it is not possible to do more

of general comfort and well-being, which she had not enjoyed since the last month of pregnancy. At this period her appetite also improves. As a rule the patient desires to empty the bladder during the first twelve hours of delivery and will be able to do so when the necessity for so doing is pointed out to her. But in some cases especially among the primiparae not only is there no desire to pass urine but even the act of so doing is for some hours impossible on account of extreme bruising the urethra undergoes during delivery and its tenderness. Further the diminished abdominal tension combined with the relaxed condition of the abdominal muscles renders the emptying of the bladder difficult.

The bowels seldom act of their own accord so long as the woman is in bed, due in part to the recumbent position and in part to the relaxed condition of the abdominal muscle and lowered abdominal pressure.

Occasional pains known as "after-pains" due to the contractions of the uterus are common and generally continue one or two days but may persist longer. These after-pains become worse when the infant is put to breast, as this acts as a stimulus to the uterine contractions.

When the patient is allowed to sit up for the first time after delivery she almost invariably suffers from a certain amount of muscular weakness. This, however, soon passes off and in a short time she regains her usual strength and energy. If after she has returned to her ordinary mode of life she still suffers from weakness and lassitude there is always some pathological condition present and its cause should be determined and removed.

The involution of the uterus and the function of lactation are both promoted by proper attention to diet and to the action of the bladder and the bowels; but there are also other means by which their course can be favourably affected. They are: (1) the proper management of labour especially the 3rd stage of labour or the delivery of the placenta or after-birth; (2) the maintenance of uterine asepsis. At the beginning of the puerperium the uterus and the vagina in a normal patient on whom no examinations have been made after the birth of the child

is made into a virtual prisoner who has to report in a certain place once every 4 hours. She may have some liberty, however, by substituting an occasional bottle when she finds it necessary to be away more than four hours. She probably gains in health more than she loses, in liberty.

By keeping the baby in good health, breast-feeding may save much time, worry and money and the trouble of keeping bottles, teats etc., clean, where a nurse is not available.

(5) One important advantage to the mother of nursing the baby is that it helps involution of the womb (the natural return of the womb after delivery to its former non-pregnant condition and size), and acts as a certain "contraceptive",—a feature which should be recognised by people especially the poor who want to avoid large families and who desire to "space" their children.

B. ARTIFICIAL FEEDING OF INFANTS

In drawing up a diet for an infant we are guided practically by the same principles as those on which the adult diet is based. The responsibility, however, is much greater, because the infant exercises no choice in the selection of his food, he receives only what is offered him, and is dependent entirely on the intelligence with which his diet is chosen for him. In an older child or adult the appetite will lead him to choose a fairly adequate diet; but the infant, of course, has no opportunity to make use of his appetite.

It is still the general opinion that breast-milk is the best food for an infant up to 9 or 10 months of age, when it has usually to be weaned from the breast; and other types of feeding have been judged by comparison of their results with those of breast-feeding.

In the absence of breast-milk the milk of various animals was turned to as a substitute, being the food Nature adapted for the young of the species. Cow's milk is the cheapest and most plentiful in our Country, and for that reason has found the widest use here. Goat's milk, Ass's milk and Mare's milk are used in various parts of the

1 teaspoonful of Cod liver oil. But Cod liver oil is preferred for economic reasons.

Cod Liver Oil need not be given in the hot summer months, when the body is usually getting sufficient Vitamin A and D from the skin as in the tropical countries, and fat in summer is especially liable to upset digestion.

COW'S MILK AND ITS MODIFICATIONS AS EMPLOYED IN INFANT-FEEDING

It should again be emphasized that whenever possible breast-milk should be the feed of choice. If breast-milk is not available the usual substitutes are:

(1) Cow's milk, pure or modified in some suitable manner, or

(2) a Dried-milk.

The first thing in feeding with cow's milk or its modification is to make sure that the baby receives a *clean* milk. A suitable dairy should, therefore, be selected and the milk should be derived from a healthy cow. In the house the milk should be kept in a clean vessel, in a cool place and covered with an unventilated cover but not with muslin or net as is the present fashion; and when the milk is finally administered to the baby, attention should be paid for the proper cleaning of the bottles, teats etc.

The second important point is that all milk should be *boiled* before being administered to the baby; and boiling is especially necessary if there is the slightest doubt with regard to the purity of the milk, and certainly for children under 2 years of age, as this is the time at which the dangers of summer-diarrhoea, Tuberculosis etc., are the greatest.

[Even in the so-called Tuberculin-tested milks of the Dairies the danger of the baby fed on such milk catching infection of summer-diarrhoea etc., is not uncommon. Hence even such milk should be boiled before use. Boiled milk is therefore sure to be *safe;* moreover, boiling makes milk more digestible, as its casein is so altered by boiling that it becomes more permeable to the digestive juices. In the case of "Dried" milk also the protein becomes more readily digestible.]

quently stupid and often selfish adult. It will produce results which are only partially satisfactory and will last only as long as the child is too young and inexperienced to find ways of evading such an arbitrary and often unreasonable type of discipline.

Punishment has at times to be resorted to. It should be accomplished in a fair unemotional and kindly manner. It is doubtful if corporal punishment is ever justifiable. If so it should be the last resort as it indicates want of proper training in the past and as a rule does more harm than good. There are doubtless a few instances when with very young children it has to be employed.

Every effort should be made to avoid difficult situations. Minor errors should be over-looked, the parent giving attention to the principles involved rather than to the specific situation. However, when a serious situation does arise in which the question of discipline is involved it is for the best interests of the child that the parent see the situation through fairly, justly and without unreasonable compromise.

Persistent scolding of children or finding faults with them—"nagging" as it is called—is never justifiable and is always a bad technic of training children.

Children must not be spoiled. Parents are apt to give their children whatever they ask for and also to save them all possible discomfort. Such children, (who are showered with the material things of the world) do not learn that after they have grown up they will have to "pay a price" for what they get. It is not best for children to be brought up in so protected an environment that they do not experience discomfort. Later on in life they will have to handle many uncomfortable situations and it is best that they learn to do this while they are young, secure in their parents' protection and with the help which their parents can give them.

Parents should not allow their children to become too emotionally dependent on them. Children who are emotionally strongly attached to their parents have great diffi-

A HOME DOCTOR FOR INDIA

This is a very comprehensive guide to the maintenance of good health in this country and deals with every aspect of health and hygiene as a glance at the Contents will show. At the same time, the whole book has been written in very simple language so that it can be understood by every one. The author writes from long experience and so has succeeded in giving a lot of practical advice in this work.

It can be said that Dr. Kamath's book should be in every home. It is suitable for general reading about the principles of hygiene and the maintenance of good health as well as for reference. Though primarily meant for the layman the book will also be of great help to the medical man. "With its authoritative accuracy it should command intelligent and intensive study from persons who care to keep themselves fit and free from avoidable disease."

Among other things, the author has dealt with factors in health and disease, general sanitation, personal hygiene, clothing, marriage, contraception, mental hygiene, food and nutrition, food requirements, faulty nutrition, dietetic values, diseases — their prevention and cure, control of communicable diseases, pregnancy, post and antenatal care, child care, childhood ailments, etc.

There is no doubt that this book contains a good deal of valuable information on health matters and will soon repay its small cost. No home can afford to be without a copy.

Price: Rs. 7-8

FOREWORD

Dr. M. A. Kamath, M. B. & C. M. is a man whose whole life has been characterised by earnestness, energy and breadth of outlook. He has many interests and has studied closely many aspects of life and living. Now his long service ended, in the autumn of his years he has decided to use his pen once more and give his fellowmen the benefit of his ripe knowledge and matured experience. Feeling that two of the essentials to happiness are health and knowledge, a fit body and a balanced mind, Dr. Kamath has developed his theme with characteristic thoroughness so as to help us all "Towards A Happier Life." I trust the volume will achieve the success it deserves and that the aims of its author will be fulfilled.

J. F. Shepherd
M.B., M.Ch., F.R.C.S.
Major, I.M.S.,
Principal,
Andhra Medical College,
Vizagapatam,

attaining a happier life and "a building in the individual a healthy body and a healthy mind from earliest life, that is, prenatal life, up to the time of death" (**THE HINDU**).

Mr. M. A. Kamath's "Towards A Happier Life" is a popular exposition of the medical sciences. A comprehensive work written in simple style and well got-up, it is at once instructive and interesting. It deals with almost all matters connected with health, and is well adapted to the requirements of the general reader, as well as the student. It is an excellent text-book on the subject of Tropical Hygiene, and deals also with Indian dietary. The book contains a mine of useful information and will remove a long-felt want. The fourth part offers useful hints to the expectant mother. It is a book every seeker after health should carefully read and act upto the advice given in it. (**THE HINDUSTAN REVIEW, Patna**).

Here is a book where the common enquiries of a layman regarding the daily problems of leading a healthier and happier life find a resting place. The reader is not confronted here by the usual technical words. It is almost a heart-to-heart talk. The author takes you into his confidence and simplifies many of your problems. The environmental factors in health and disease. The value of hygiene and sanitation, dietetics, causation and prevention of diseases, the expectant mother and her child,—have all been fully dealt with. In fine, this can be easily styled as a health Encyclopaedia—for nothing of importance **has been left out by the author. (HUMAN AFFAIRS)**.

live the right kind of life health can be preserved and disease can be prevented. Health is man's heritage and should be as natural as the air he breathes, and God has meant man to be healthy and happy and live to a good old age. Therefore, to the question how we can keep healthy and prevent disease, comes the answer: "We must go to the very foundation, build well our environment and endowment and improve our nurture and nature; good nurture today means good heritage tomorrow. Bring up healthy children today and we shall have healthy citizens in the next generation."

The evils of poverty, of bad feeding, bad housing and bad living, and of certain customs like child-marriage, will closely follow us and be felt for generations, unless we go to the very root of these evils and radically change our housing, our feeding, our manner of living and our harmful customs, in one word "improve our environments."

There are four cardinal factors which contribute to the efficiency and well-being of individuals and nations: (1) Fresh air and sunlight, (2) good housing accommodation, (3) adequate amount of work and exercise and rest, and (4) an adequate and well-balanced diet.

"Throw open your house to God's fresh air and sunlight and cultivate the habits of cleanliness, cleanliness within and cleanliness without; bring up your children in open-air life and you will drive away sickness" is the advice of Dr. Muthu, the veteran Tuberculosis Specialist. In fact, this forms the rationale of the modern open-air treatment of Tuberculosis.

Country air is certainly much less vitiated than town-air. Hence it is that tuberculosis is much more common in towns and congested areas than in villages, and that is the reason also why Sanatoria are always built in country parts and in less congested localities, far from the dust and bustle of towns. The value of fresh air cannot be exemplified better than by pointing out the fact, that the staff—medical, nursing and menial—employed in the Tuberculosis Sanatoria are particularly free from the disease, inspite of the fact that they are constantly, day and night, coming in close contact with tuberculous

develop the body but develop the mind also by fostering team spirit and comradeship, and builds a sports-man-like character. People who in thousands watch football and cricket matches are doing their health more good than they probably realise. There is no tonic among all the hundreds in the Pharmacopia, with such a potent influence on health. People are apt to sneer at those who merely look on as spectators at a play from which they get no actual benefit for themselves, apart from the amusement or excitement. As a matter of fact any change from the daily task and the general stimulation which healthy excitement brings are not to be lightly set aside. They are most important factors in the bracing up of mind and body, which is also essential for their healthy growth.

Fresh air and sunlight, nourishing food, good-housing and rest and exercise are, then, the four requisites of good health. They form the four corner stones of the Palace of Health. True civilisation is one that aims at educating and uplifting the fallen brethren in society, and if we should earnestly strive to do something every day towards the alleviation of their suffering we can hope to make our Motherland a brighter and happier place for us and the coming generations to live in. And if we should succeed—and there is no reason why we should not when several nations have succeeded—we can confidently hope in course of a few years to build a stalwart and healthy nation, the Indian Nation, of which we may rightly be proud and which will ever stand second to none among the World's nations.

Public Health in India and the Government Aid. The Annual Reports of the Public Health Commissioner for India present a true record of the state of public health in this Country and the ways and means adopted by the State towards its improvement; and the latest report, that for 1936 published in September 1938 is typical of its predecessors. A perusal of it shows that since 1931 when the last Census was taken the Country has comparatively been free from violent outbreaks of epidemics, and during the same period the annual balance of Births and Deaths has been consistently favourable to progressive increase of

experiment in the culture of the palm has been carried out in Negapatam in South India. The climatic conditions of certain parts of South India approximate closely to those of Malaya where the palm is grown extensively; and if it can be successfully cultivated in these areas the supply of cheaper Vitamin A, so obtained would be of the greatest advantage to the poorer population of our Country.

Deaths during the year 1936 were nearly 6½ millions. It may be said that throughout India during 1936 conditions were relatively healthy. The death-rate is 23 per mille, i.e. 1,000 of the population in 1936 against 22 in the previous year.

The Infantile mortality during 1936 for British India was 162 per mille, and the still-births recorded were 21·2 per mille of live-births.

Of the 46 Countries of the world from which the infantile mortality is available, 40 Countries recorded in 1935 rates *lower* than that of India, the remaining 5 being Strait-Settlements, Roumania, Chile, Ceylon and Malta. The range of variation in the infantile mortality-rates lay between 32 for New Zealand and 286 for Malta; while nearly half of the 40 Countries recorded rates over 50 p.c. *lower* than that of India. This comparison is given to show *how far behind India is* in respect of the measures taken for the protection of infant-lives. Statistics show that about 47 p.c. of the total Infantile mortality in British India takes place within the first month of life. The subsequent periods, 1 to 6 months and 6 to 12 months, are relatively less fatal. Infantile mortality during the first month of life is largely dependent on factors influencing ante-natal life, particularly so in the case of deaths within the first week. During 1936 the deaths under one week formed 28 p.c. of the total infantile mortality, and 60 p.c. of the deaths within one month of age.

This should not cause us any surprise, because as mentioned already, our food is poor, sanitation bad and we are enslaved to certain social customs and habits which drain our vital strength and are dragging us down to the lowest expectation of life. "Expectation of life" is another index of the health and vitality of a people. While

TOWARDS A HAPPIER LIFE

PART ONE

I. Environmental Factors in Health and Disease

It had been recognised even from the days of Hippocrates that the factors which made for health and disease were numerous and complex, such as air, water, soil, sunlight, heat, cold, climate, season etc. But with the discovery of bacteriology and the recognition of the fact that each disease was brought about by a specific bacterium there has been a tendency to divert from all such indirect and complex causes to one of over-simplification. Now, the tide is turning and we realise that very few phenomena in Nature are related to single isolated causes; we recognise, for example, that the predisposing factor in a case of Tuberculosis is more often a lowered vital resistance than the mere entrance into the system of the Tubercle bacillus; we understand that the season of the year is as essential a factor in favouring the prevalence of pneumonia as the presence of the causative microbe itself. In short, we recognise the importance of the physical environment upon health and disease; and the atmospheric envelope which surrounds us everywhere is one of the most important elements in this environment.

It is common knowledge that the general death-rate in temperate climates shows two regular seasonal maxima or 'peaks,' in late summer and in late winter. Two distinct groups of diseases are chiefly responsible for these peaks—the warm weather group of diseases like infectious diseases, cholera, typhoid, yellow fever and malaria, and the other, the cold weather group, like pneumonia, bronchitis, tuberculosis, diphtheria, rheumatism etc. Geographically also we find practically the same general

from the sub-soil water, which percolates into them from the surrounding superficial soil; and if the soil be of a porous nature impurities derived from the surface in the neighbourhood of such wells will also percolate into the water polluting the water and rendering it unsafe for consumption.

Although the soil is able to remove some of the impurities at the beginning, the filtering power of the soil will eventually be lost, so that the sewage gets into the well in an unfiltered state and contaminates the water to a dangerous extent; and if the wells are, as is often the case, situated close to open drains, privies and other sources of pollution offensive matters drain into them and render the water positively dangerous. In fact, in most cases direct contamination is derived from surface washings.

Trees growing at the edges and lining of wells, with their leaves falling into the water and decaying are common sources of pollution of wells; so also birds building their nests in crevices soil the water by their droppings.

As the supply of most wells is the under-ground stream moving steadily in the direction of its natural outlet, heavy rains might raise the level of the subsoil water and may wash impurities from leaking cess pools etc., into wells lying between and below the source of contamination and the outlet. Hence a shallow well may also be the source of danger not only from the surface but from more distant contamination.

The danger of contamination might be considerably minimised by improving the method of construction of these wells, by steining the wells with brick and mortar or similar impervious material; there should be a parapet wall about 3 feet high above the level of the ground to prevent surface washings from flowing into the well. All wells for public use should be protected by a cover and the water drawn by means of a hand-pump. The most important consideration in connection with digging of wells is that sites should be selected after taking into account the surface configuration, the nature of the soil and the possibility of contamination by the neighbouring heaps of rubbish, cess-pools, latrine, manured lands or

down into a well by a rope, allowed to sink and brought up and down two or three times so as to ensure thorough mixing. After several hours a pink tinge still persisting in the water indicates that a sufficient quantity of the permanganate has been used.

D. Mechanical means of Purification. Filtration of water by some means or other has existed in India even from the days of the great Manu, who recognised the necessity for purification of all drinking water, but the method advocated was to filter through a few layers of cloth. This method is, of course, inefficient, as it can remove only the grosser and suspended particles from the water and not the harmful germs of disease, the destruction of which can be accomplished only by boiling the water filtered through cloth.

Filtration through sand and gravel—"Slow Sand Filtration" is the modern method of improving the water supply of most of our towns; and simple filtration through sand-beds was first introduced into England by James Simpson as early as in 1829 for the purpose of improving the appearance of water, and which proved, when bacteriological methods became available later for accurate study, to be equally efficient in removing intestinal bacteria such as the germs of typhoid fever, cholera, dysentery and bacillus coli.

If one studies under the microscope the relative size of bacteria and of sand grains it would be obvious that there is ample space for bacteria to pass between the relatively huge masses of sand or gravel, but as a matter of fact the bacteria are strained out by a process of adhesion aided by the formation of a glutinous film on the surface of the sand grains throughout the bed; and experience has shown that passage of water through a 4-feet layer of sand of the proper size will render even a heavily-polluted water safe for consumption.

As the rate of filtration through sand filters is comparatively slow and requires a large area of filtration bed and is likely to be suspended altogether after a time, an improvement on the purely mechanical filtration is to treat the water before filtration with some form of coagu-

tive function and the general weight and strength. Further, the regulation of circulation helps to make the musculature firmer and better than the best massage.

Cases of carbuncles, chronic eczema, lupus and alopecia are rapidly benefited by exposure to the ultra-violet (U. V.) rays, as the inflammation so set up brings extra blood and lymph to the affected part and these cause healing. A carbuncle in the early stage is made to abort thereby and much pain and trouble saved. Bernhard of St. Moritz exposed war-wounds to sun and air with good effects. There is no better dressing.

Properly controlled solar radiation in open air influences favourably the* Basal metabolic rate (B.M.R.) particularly if accompanied by exposure of the body to air and bathing in salt water. It is well-known that after a well-contrived exposure of the entire body to the U. V. rays most people feel invigorated and are in a better frame of mind, their psychological tone being distinctly better.

The chief effect of the U. V. rays is to maintain a proper Calcium balance in the system and build up its bony frame-work (by activating ergosterol in the skin in such a way as to produce Vitamin D.) Even before the baby is born its skeletal development is influenced by the sunshine that reaches it through the mother, and the fundamental importance of sunlight in building and maintaining the bony frame has now been proved both in health as well as in rickets. This does not mean that proper food with an adequate amount of Vitamin content is not a necessity. A working labourer with his scant cloth, whom we might be inclined to despise is really a wiser man than ourselves, for, he allows himself to be nourished and strengthened by the sunshine and fresh air that feed him perhaps more than the rice or ragi he eats. The same reasoning applies to teeth as special bony structures which have much the same needs for growth and a sufficient amount of sunshine.

Sunlight is even reputed to give antirachitic properties to most substances like cereals, meat, milk etc., and accelerate the growth of both animal and vegetable life.

* Will be explained under Dietetics.

and places of refuge for rats, vermin etc. Hence the need for their early removal and effective disposal. The refuse should be collected in water proof pits or metal dust-bins, as its deposition on the open ground or on the roadside is objectionable, being liable to be scattered about by the wind or stray animals, or washed out of the heap during rain. The dustbins are best made with corrugated iron, the simplest shape being a circular one open at both ends and provided with two handles. They should be placed on a water proof cemented surface, always at a fair distance from a house and provided with a suitable cover.

In India owing to climatic conditions and rain the refuse decomposes rapidly, and flies and mosquitoes and vermin multiply equally rapidly. It is, therefore, necessary that the contents of the dust-bins should be removed daily or more frequently by especially constructed carts, which are preferably made tiltable for facilitating their emptying at the place of disposal of the refuse. The refuse carts should be properly covered to prevent nuisance while being driven along the streets, while the collection itself should for the same reason be done during the early hours of the morning when traffic is slack.

After collection the refuse should be disposed of in such a manner as not to create nuisance in the neighbourhood of dwellings, nor to contaminate the source of drinking water in the neighbourhood. *Dumping* and filling insanitary lands or reclaiming low-lying lands is the common method of disposal; but since this creates a great nuisance to the neighbourhood by the production of offensive gases and breeding of flies and harbouring rats and other vermin, it is necessary that the land selected for the purpose of dumping should be as far away as possible from human habitation, or outside the limits of the town, so as to be far away from drinking-water source also.

Incineration or burning up of refuse so as to render it harmless is another method of disposal. This is generally done in special types of incinerators; the refuse is thereby reduced to about 1/4 or less of the original mass and the dangerous and evil smelling organic matter is transformed into innocuous vapour and residue. The residue left

liquid refuse from cowsheds, stables, houses and factories is known as 'sewage,' and waste water from houses etc., unmixed with solid excreta is "sullage".

The primary idea in the purification of sewage is to convert the harmful complex organic matters contained in the sewage into innocuous and simple inorganic chemical compounds. This result is obtained by the "oxidising" action of certain types of saprophytic bacteria normally present in the sewage itself, in the presence of sunlight, an action similar to but not identical with the action of the nitrifying organisms on the trenched human excreta.

The process of purification of sewage by the action of microbes is known as the "biological treatment" of sewage, and consists mainly in the application of the liquid sewage (after filtration) to specially chosen porous land; which after a time comes to retain in its soil only the inorganic nitrates and other oxidised products of the organic contents of the sewage. These have a high manurial value and the land may consequently be utilised for the cultivation of coarse-grass, sugar-cane, plantains, green vegetables etc., with profit. Ordinarily no harm results from the consumption of vegetables grown on such farms, but it is desirable that such vegetables should be properly cooked with heat so as to destroy any ova of intestinal worms that might possibly remain alive in badly managed farms.

5. INDUSTRIAL HYGIENE

While it is almost impossible to change the habits of the members of a household it is possible by Law to govern the conditions under which people may work for others. This is Industrial Hygiene; and there has been no branch of the Sanitary science that has made greater strides in later years than this one. The working conditions of millions have been improved and many lives thus saved. Factories are now built with the idea of the comforts of the employees in mind, and the dangerous and hazardous trades have been made more safe by the introduction of safety—devices on every machine on which this is possible. Dust, which in the older days predisposed

III. Personal Hygiene

1. Cleanliness

Our ideas of the significance of cleanliness have an ancient as well as a complex history. We find some tracing their origin to religion. Primitive people had an elaborate ritual calculated to satisfy the supernatural powers of evil, and in order to accomplish this a great variety of actions came under a taboo. The penalty for the violation of the ritual was to be declared as "unclean", which meant that the individual was unfit and unable to perform the rituals upon which his own welfare and that of his community rested. The affected person became thus a danger to society and was temporarily outcast from it. He was compelled to recover this psychological cleanliness before he could be readmitted into society. This recovery of cleanliness was accomplished through acts and rituals that still continue to be symbolised in our modern ideas of cleanliness.

Primitive people, then, considered cleanliness a matter of the spirit even though their ritual meant a certain amount of physical endurance also.

Most of the ancient religions gave a prominent place to cleanliness and in some of them it acquired a definite relationship to disease. The followers of Zoroaster could not travel by sea very conveniently, because they were forbidden to defile the sea under penalty. Women were held "unclean" under a variety of circumstances, as at menstrual periods or at child birth, which were occasions requiring unusual precautions in order to recover cleanliness after these physiological processes. Even to this day the Parsi home sets apart a room for the monthly seclusion of women.

Among the Greeks marriage was preceded by a ritual of purification, and the "marriage bath" was one of the most essential items in the wedding-rites. Death and dead bodies produced uncleanness that required purification by water, fire and smoke.

and fomentations or radiant heat sources is only limited to the skin surface and does not produce deep heating, but in the case of the High Frequency current, the heat penetrates deeper throughout the field. Deep inflammatory conditions of accessible organs like the prostate and the uterus can thus be relieved and also the backache and longstanding dull sickening pains dependent upon them.

A hot bath followed by a cold douche is most stimulating to the skin and by way of the nerves and alterations of blood supply affect the whole system. In the hot bath the skin is flushed with blood and lymph and sweat is poured out, whereas by the cold douche blood is drawn out of the skin into the deeper organs.

Heat in all forms flushes the skin and brings more blood and lymph to the heated parts, increases the temperature and raises cellular metabolism. By heat the tissues are relaxed and softened and pain relieved. A patient crippled with chronic rheumatism can then move the affected joints with much less pain, and such active exercise is more effective than massage in bringing relief.

Habits of cleanliness can minister effectively not only to mere maintenance of life but also to a raised level of health, and cleanliness of the body and the environment are among our most effective methods of prevention of communicable disease.

Oil Bathing. The Indian custom of anointing the body and head with oil before a hot bath has the advantage that it keeps the skin from becoming overdry or cracked in the cold weather and prevents injury to the skin from exposure to the burning rays of the Sun. Oil baths do also prevent the epithelium becoming sodden as in the condition known as the "washerwoman's" hands. Moreover the oil facilitates shampooing the body which may with the best advantage be done before a bath. By kneading and rubbing the circulation is quickened and the muscles exercised (passive exercise) giving a refreshing feeling.

2. EXERCISE

The maintenance of health in the normal organism is

whatever helps or retards the growth of the body does help or retard the proper development and functioning of the mind also. This is one reason why physical education has become an integral part of all sound systems of general education all over the world.

Hence, whether in the education of the youth for right citizenship or in the extension of democratic ideals in our Country, primary consideration should be given to the physical well-being of the youth; and next, all available means should be provided by which the youth can gain actual experience in right living, that is, living in accordance with the highest ideals of personal and social conduct.

In the field of physical education moreover, there is ample opportunity for nation-wide and comprehensive social service, through what is known as the National Recreation or Playground Movements.

These movements had their beginnings in America where, in common with the countries of the West, large-scale industrialisation and overcrowding in the cities brought in their train many problems seriously affecting the health and well-being of the people, and so great was the response to the peoples' call that within a few years, it is said, the number of playgrounds in the cities of America increased in some cases fifty-fold.

In our Country there is no dearth of wide spaces, but there is lack of comprehensive organisation to utilise them for the active recreation of the people, in order that they may find a real pleasure or joy at least in play. It is, however, a happy sign of the times that such movements are being set on foot in some places in our Country too.

Now the education that is imparted to our youth to-day, whatever be its short-comings in other respects, can be said to have achieved this objective—of a balanced growth of mind and body—in no small measure; and the present generation of students deserves to be congratulated on having opportunities in that direction —facilities which never existed or were not even thought of fifty years ago in our days. They have now, for example, suitable hygienic environments, such as gardens, open grounds for play

entire system are suspended and the conscious mind rested.

Sleep is evidently a habit acquired by man through thousands of years when his activities of the day naturally terminated with the setting of the Sun, there being no artificial light known in the early days of man's history. That being so, sleep should be considered a "bad" habit in these civilised days when nightfall is no handicap to most occupations. This does not mean that we can do without sleep, a habit formed thousands of years ago cannot be given up at once, and lack of sleep is quite detrimental to mental and physical efficiency and to health. In fact lack of sleep for a long number of hours often gives rise to mental ill-health and might even kill much more rapidly perhaps than lack of food.

Sleep varies in depth and effectiveness. It is better to sleep well than to sleep long, an hour of the best quality is worth many hours of the worst. The ideal sleep is a comparatively dreamless sleep with a minimum amount of body movement procured in an environment with proper air, light and sound conditions and not terminated by alarm clocks or other external stimuli. Much sleeplessness could be avoided and a great increase in the benefits of sleep could be secured if we took greater care in providing favourable environment and proper mental preparation. Consideration should be given to the character of the bed and the bed room; proper ventilation and control of lighting and noise have much to do with the quality of sleep, even though the sleeper does not wake.

Ideal size of the bed is a double bed for each person in order to encourage muscular relaxation and healthy posture. A narrow bed reduces effectiveness of sleep by apprehension of falling. Bed covers should be light and warm. The placing of bed so that the early morning sun does not shine on the face is worthy of attention.

The preparation of the individual for sleep is of equal importance. See that the stomach while going to bed is not heavy with late meals; as then you are apt to get nightmares on going to sleep; proper restriction of fluid—intake late in the day will prevent disturbance of sleep from having to get up for passing urine. Mental attitude and

friction of body increase it and to a small extent the ingestion of hot foods and fluids. Climates of high temperature or external applications of heat to the surface of the body may impart heat to it, as the blood at the surface carries the heat throughout the body.

Heat-loss is due to both radiation and conduction as well as to evaporation of water. Radiation and conduction of heat from the surface of the body are controlled by variations in the blood flow through the skin. As the surrounding temperature approaches the body temperature, heat-loss by radiation and conduction becomes increasingly difficult, and from this point on evaporation of water must be depended upon, and evaporation is the largest, single factor in heat-loss. The avenues by which this loss occurs are the surfaces of the mouth, tongue, pharynx and the lungs; and through the activity of the sweat-glands sufficient moisture is furnished for evaporation and heat-loss, unless there is some serious interference with the nervous and circulatory and physical pathways.

Maintenance of a Uniform Temperature. Since we live in an environment of constantly changing temperatures we require a delicate adjustment between heat-production and heat-loss. Now, clothing is one of man's most significant contributions to the control of his environment. Many of our most curious errors in the use of clothing are due to a failure to recognise the fact, that clothing does not create heat but merely diminishes the rate at which the heat (produced in the body) is lost.

Hygiene of Clothing. From the hygienic point of view good clothing should be such as ministers most satisfactorily to the needs of decoration, modesty and protection. Generally speaking, the aged and the infant need more clothing on account of the fact that the temperature—regulating mechanism is feeble in the one and not fully developed in the other. Care must, however, be taken to avoid the habitual use of much clothing by the infant lest he become sensitive to external temperature changes. On the other hand, exposure to sudden changes of temperature may result in gastro-intestinal or respiratory disorders.

contracting some forms of skin-disease—such as dhobi-itch and barber's itch—through clothing, hair-combs, shaving razors and shaving brushes. Each man must have his own shaving set and should not depend upon the barber, however clean his kit be. Soap should always be used for a shave, as soap is a good disinfectant and prevents conveyance of skin disease and even the syphilitic poison. Hair brushes and shaving brushes have spread anthrax and have to be carefully disinfected before use.

7. MARRIAGE

Certain questions regarding marriage in our Country especially deserve our attention from both economic and hygienic considerations, as they relate mostly to our social customs, such as Infant-betrothal, infant-marriage and marriage among blood-relations. Luckily the first two customs are at present things of the past since the passing of the Child-marriage Restraint Act of 1928—The Sarda Act—by which no person, if a male under 18 years of age and if a female under 14 years, can contract marriage.

The disadvantage of infant-betrothal is that not only are the parties to the marriage disposed of without being themselves consulted, but in the long interval between the betrothal and the actual consummation anything is possible, and disease or other circumstances might render one or other of the parties quite unsuited to married life; moreover, consummation of the marriage at a very early age is also encouraged by the practice, and if the girl becomes a widow religion demands that she be condemned to perpetual celibacy all through her life.

From a purely physiological point of view also early marriage is to be condemned for the reason, that sexual indulgence in either sex before their physical development is complete, is disastrous to health, it causes lack of manliness and vigour in the male and it exposes the immature female to the dangers and risks of pregnancy and parturition; and a mother who has to provide nutriment for herself as well as for the baby inside her is likely to prove unequal to either task; the result is that the children born of such mothers are less robust and less vigorous than those born of mature parents. Infact one cannot imagine how

direct sunshine a comparative stranger. Finally, when with the development of industries and increase of manufacture and consequent rush for Town-life the atmosphere became impure, laden with smoke, dust, dirt, toxic gases and fumes, the most vital and all energising rays of the Sun were practically shut out from him. Constant breathing of such an atmosphere lowered his strength and working efficiency, his vitality, his well-being and his power of resistance to disease. Rickets, Tuberculosis, Heart disease, were the inevitable result. While the effects on the body were bad enough those on the mind were worse, as "gloom without made for gloom within and induced mental depression."

Man next developed a new taste, an appetite for the pleasures of the table. From the fresh and natural food of his early days he slowly went on to refined foods, seasoned foods, artificial foods and preserved foods—all these are devitalised foods and deficiency foods in the extreme; and took to tea, coffee and liqours—"ales stronger than Adam drank," and smoking. Such life coupled with sedentary habits, excesses of various sorts and late hours of clublife, rendered possible by the discovery of electric power and light, upset his digestion, interfered with his rest and rendered him liable to dyspepsia, liver abscess, gout, rheumatism, diabetes, Bright's disease, high blood pressure, cancer etc. Venereal disease slowly crept in, in fact, it has almost become a truism to say that Syphilisation was concurrent with Civilisation. The sweet pleasures of the table have after all led to bitter griefs of life.

Lastly, the speed, the stress and keenness of competition of modern industrial and social life shattered his nerves and rendered him unable to stand the strain of civilisation; the result was a general mental weakness perhaps verging on insanity, with its suicidal and criminal tendencies.

Thus, paradoxical as it may seem, the blessings of civilisation have given rise to an immense increase in the suicidal rate, new forms of disease of the body and the mind, growing social unrest and a tendency to revolt, a spread of crime, unemployment and poverty and want.

scribed as brandy; the effect of alcohol, however, in such cases is only temporary by stimulating heat production and the action of the heart, thus enabling the patient to "tide over a crisis", and alcohol does really so enable; in-fact, even in the case of "delirium tremens" caused by prolonged addiction to a large quantity of alcohol the very cause, alcohol, that has brought about the condition serves to effect a cure in extreme cases.

The popular belief that alcohol prevents "catching cold" is altogether unfounded, and must have been built on the theory that alcohol increases heat-production by itself serving as fuel. On the other hand, alcohol causes the blood-vessels of the skin to dilate, large amount of perspiration thus results, by the evaporation of which the body loses heat rapidly. This loss of heat necessitates the body to oxidise more food to make good the lost heat, and the body becomes thus overworked or fatigued.

Physiology teaches that when the vital forces are exhilarated and made unnaturally active by the use of such drugs as alcohol, this over-activity is invariably followed by a corresponding degree of depression of the Heart and the Nervous system; and to "keep the spirits up" the addict "pours more spirits down" his throat. Habit is, thus, readily established.

It is common experience that some persons, especially those in vigorous health are able to stand a surprisingly large amount of alcoholic liqours with comparative impunity; but, whenever a test can be established it will be seen that those who have *habitually refrained* from all such stimulants, other things being equal, will undergo fatigue and hardship, which those accustomed to these stimulants, but who may not have shown signs of having been affected thereby, will be *unable* to endure.

The addict, therefore, who takes to more drink under the mistaken notion that he increases thereby the production of heat to guard against external cold, does so at very great risk indeed, as the reactionary depression following the stimulant effect renders him readily liable to catch a much more formidable disease than cold, viz. pneumonia, dysentery etc., and the chances of recovery from

the stimulation of alcohol is the worst enemy of the human race; and we have already seen that its effects on individual health are disastrous and more so on the health of the progeny, not to mention the moral and social degradation that its use entails.

Nations long addicted to alcohol count perhaps the largest number of idiots or imbeciles among their progeny, and neurotic individuals whose nervous system has become so shattered that they can hardly stand the stress of civilisation. America is such a nation to day, and although she has for some time practised temperance—lately however, she has gone "wet" again—the neurotic temperament which her present generation inherited from their wet forefathers still continues to play its havoc, and explains the existence of perhaps the largest number of criminals or lunatics among her population. Yet the economic prosperity and moral wellbeing of America are said to be mainly due to prohibition.

The loss to national wealth by way of ill health, lowered racial vitality and incapacitated labour arising from the drink-evil is unimaginable, nor does the evil stop with the individual. It passes down, we have seen, to his progeny, causes family instability and wrecks his economic existence. The children of such parents are bound to suffer by reason of inherited neurosis or venereal disease and consequent germinal impairment, or poverty and want of proper care on the part of the parents in bringing them up. Such children cannot make useful citizens and members of a decent society, their ruin is ensured by the folly of their parents.

The effects of the drink-evil on a nation cannot be better expressed than in the words of a great British Admiral who said, "alcohol cut through the efficiency of Nations and weakened their fighting forces; one great cause of the early reversals of our Allies in the Great War of 1914 was the alcohol and tobacco habits of the Nations."

Is Drunkenness inherited? In other words why is it that drunkenness is often noticed generation after generation in the same family? Is not this obviously because a man who first gave way to drink passed on the evil habit

been tried in America and some of the European States and attempts made to enforce it by means of special preventive services at immense cost; but after about 12 years' time the experiment proved an utter failure, with the result that the State not only lost the huge revenues and excise but had to spend large sums of money on the preventive measures in addition, and the consumption of alcohol remained little changed.

The reason adduced is that in America this problem was considered purely from a moral and religious point of view and not from the point of its being a social and economic evil, as it is everywhere. Further, it is said that the protagonists themselves forming the wealthier class were not sincere in their pursuit as they still continued the use of liqour being little affected economically thereby.

The system of limiting the number of hours of the sale of spirits in public places has been tried in Europe, but has not met with any appreciable success.

The Indian problem, however, appears to be less intricate, the drink-evil being much less prevalent than in America or Europe, and all that is required to be done is to keep the temptation of drink out of the way of the poor labourers, peasants and the lower classes of population, because it is they that are most affected by the evil habit and not the other classes, who do not as a rule take alcohol, and if they do, they are not much affected economically thereby.

The lessons learnt from the history of prohibition in Europe and America do, therefore, teach that the Indian problem has to be considered only from social and economic standpoints, and not from a religious one, because, however important the moral and religious aspects be, they cannot be enforced by law, but have to be left to individual enlightenment; and the social and economic welfare can, however, be achieved by enacting law. Such laws have already been formed in our Country by the present Congress Government and experiments already set on foot in some of the Districts of Southern India and elsewhere, and so far there are good indications of the experiments

Irritable heart or Soldier's heart) is a dangerous affection rendering the victim unfit for active field work and has led to the rejection of thousands of would-be recruits to the late wars; and Colleges and Universities have recognised that cigarette-smoking has seriously interfered with the efficiency of their athletic teams, and whoever desires to be in the best form should abstain from smoking. Confirmed smokers have never been amongst long-distance-swimmers or rowers or cyclists. Dr. Seawer, Professor of Physical Culture in the Yale University found by a series of experiments that non-smoking students made far better records in physical development than smokers, their increase in height was 24 p.c. more than the others, while in their chest or breathing capacity, their superiority was more than 77 p.c. (Olsen).

Smoking is a common cause of dyspepsia; such cases do yield to no treatment unless and until the habit is discarded.

Confirmed smokers do suffer from some sort of weakness of eyesight (amblyopia) and sometimes actual blindness (amaurosis); and investigations have confirmed the observation that men employed in tobacco factories do also suffer from such defects.

Other organs like the liver and kidneys also are not spared by tobacco; and perhaps its most pernicious action is in causing a general lowering of man's vitality and his power of resistance to disease. As in the case of alcohol a confirmed addict has very poor chances of recovery from any disease that he might contract. Surgeons dread to operate on such a person as he is a difficult subject for chloroforming by reason of weakness of the heart and lowered vitality, and the operation wound will heal but slowly if at all.

Smoking produces in the long run a form of chronic inflammation especially of the tongue, (the glossy tongue), giving rise to whitish patches (leukoplakia), which in the aged or in the debilitated easily become cancerous; and cancer is extremely common among people who smoke the pipe. Cancer of the mouth is equally common among those who constantly chew tobacco with betel leaves and

seen, the habitual use of drugs of a stimulating or restorative character was prevalent in our Country long before it did in any of the other countries of the modern world. The juice of the Soma-plant, we said, was a favourite drink of the early Aryan Settlers of India. During the Hindu Period till about the 9th Century alcoholic beverages were freely used by people, as well as preparations of ganja or Indian hemp. They produced not only a sedative effect but also brought about "euphoria in the form of pleasant dreams, forgetfulness and voluptuous satisfaction."

Opium and poppy were originally introduced into the West Coast of India about the 9th Century A. D. by the advent of Muslim traders of the West and opiates soon came into use. A study of the Records shows, that during the period of the Moghul Empire alcoholic beverages opiates and hemp-drugs were freely used. A decoction of poppy capsules known as *Koknai* was extensively used all over India and is used to the present day in certain parts of the Punjab. A beverage containing wine, opium, Indian hemp and poppy capsules known as "Charbhaga" (four-fold) was drunk by the well-to-do classes in the time of the great Akbar and later. Opium on account of its strong intoxicating properties appears to have taken easy hold of the people and is indulged in by all classes, and it is said that poppy cultivation was extensively carried on all over the Country during that period.

A. OPIUM

Opium is the inspissated juice of the unripe poppy capsules (Papaver Somniferum) obtained by incision. Raw opium is generally consumed in the form of a pill or solution in water; smoking of opium is uncommon except in the lower strata of society. Opium smoking is more common in Assam, Central Provinces and Berar than in other parts of India. The proportion of opium smokers to opium-eaters in Assam has been variously estimated from 1|3 to 1|2 of the total addicts, but recent enquiries show that the number has now come down to 1|4. At present the Government of India and all the Provincial Governments have adopted the policy of checking opium-

laughing, singing or furiously delirious. Small doses in susceptible individuals generally produce peculiar symptoms usually described as "floating in the air."

One curious effect of full intoxication with Ganja is that it produces enormous apparent "prolongation of time and exaggeration of distance."

Hemp drugs are cerebral stimulants and they also produce mental disorders; in the latter respect they are above alcohol, opium or cocaine.

Medicolegal aspects. Insanity is the inevitable result of the use of hemp drugs whether in excess or in moderation for a prolonged period and is easily induced in those with a neuropathic or psychopathic heredity.

Persons intoxicated with the drug are often liable to commit homicidal violence or murders. It is said that many a time murderers may take the drug to steady their nerves before committing an intended murder.

"Running amok"* is common in the intoxication from hemp drugs, the individuals committing a series of murders with or without a definite intent, the victims being not necessarily their enemies; after complete recovery they have no memory of their crimes and invariably plead "not guilty."

The Ganja-habit among some cases of criminal lunatics appears to be rather a symptom than a cause of insanity—a vicious circle was thus formed, insanity leading to Ganja habit and Ganja habit leading to insanity or some form of "an acute confusion"—when the person does not know the nature of what he was doing.

C. COCAINE

Is an alkaloid, the active principle derived from Erythroxylon coca and came into use quite accidentally about 80 years ago. In 1859 Scherzir brought the coca leaves from Peru, Bolivia to Europe and noticed the numbness of the tongue and the mouth resulting from chewing the leaves. The Peruvian Incas Surgeons are supposed to have chewed coca leaves and dropped the saliva on the wounds of patients. Coca leaves are chewed in S. America as a restorative from fatigue.

* A Malayan word meaning "rushing in frenzy."

Exercise, as we saw, not only promotes physical health but is also a means of dispelling emotional tension. The amount of exercise each individual needs must be adjusted to his physical condition and to the time at his disposal. The majority of our people need much more exercise than they take. This is particularly true of businessmen and housewives. A long walk, 3 or 4 miles a day or some form of exercise equivalent thereto will be sufficient.

Play is an ever-ready method of relieving emotional tension and acquiring new interests. It has been well said that *children need to play, but that adults must play.* "Play is the shock-absorber which takes the bumps out of the road of life." In contradiction to work, which has been defined as "a responsible activity directed toward a more or less important objective", play has been defined as "an irresponsible activity directed toward a non-important objective." It is the element of irresponsibility which distinguishes play from work, a fact which is frequently forgotten by modern man, who is apt to take his play altogether too seriously.

Sports and Hobbies are conducive to mental stability, and for this reason, if for no other, should be carefully cultivated. The importance of interesting sports and hobbies is emphasized from the stand point of health.

Diet, as such, plays little part in mental hygiene. It seems that human beings who partake of a mixed diet in moderation are most apt to be physically and mentally comfortable. Contrary to popular opinion a moderate amount of coffee, tea, alcohol and tobacco is not injurious even to persons who are inclined to be nervous. Dietary fads are distinctly harmful and unhygienic and are scientifically incorrect; they often encourage patients to be more "suggestible" and are very apt to fix the individual's attention on himself. It is important from the mental hygienic point of view that an individual's diet should not be interfered with unless actual medical necessity demands such an interference, temporary or permanent.

Constipation is not a *cause* of nervous or mental illness, but it is often the *result* of such difficulties. Nervous people are apt to worry about their evacuations,

analysis of the forces to which one was subjected in childhood is often very enlightening in helping an individual to understand the nature of his own reactions as well as to remove uncomfortable and objectionable traits.

Social factors. Our present day society is a closely-knit fabric and we must learn to fit into it, to play our part and contribute our share to the welfare of the group. Those who will not become a part of the environment in which they live, who hang back or for one reason or other refuse to fit into the world as it is constituted, as a rule become increasingly subjective and introverted and are given to neurotic and mental disturbances. It is no longer possible for individuals or nations to live alone in the world, for we are all interdependent on one another. We must therefore, learn to live and work together maintaining all that is good in our own individuality and yet employing our individualism for the welfare of the whole organisation. The adherence to such a principle is one of the basic laws of mental health. Social relationships should not only be maintained throughout life, but should be constantly broadened in order that "the rough corners of our own personalities may be smoothened by the contact of broad associations." Through such associations we reach a better understanding of the world in which we live, and by virtue of fitting into the social-whole we are better able to contribute to it.

Some people have a tendency to do their work and then isolate themselves as far as possible from their fellowmen. This is a great mistake. We must take every opportunity to mingle with our fellow-beings not only on the basis of work, but we should also take part in their recreation and hobbies, and allow them to share these with us. Some few people allow their social duties to go to such an extent that it interferes with their rest and other occupations, which in turn is a mistake in the other direction.

Poverty and wealth are two other factors which are important to mental hygiene. If they are properly handled by the individual there is no reason why they should be a cause of nervous or mental difficulties. Poverty is

of the psychoses. It is also of tremendous value in the handling of the feeble-minded and promises much along the lines of prevention of mental instability and mental disease.

In short, mental hygiene is concerned particularly with the prevention of the disorders of the mind, and even mental maladjustment which prevents the individual from maintaining his place in society in a par with that of his fellow-beings.

PART TWO

DIETETICS

1. Food and Nutrition

The present knowledge of nutrition can be said to have opened one of the most dramatic chapters in the History of Medicine, and scientific facts about the relationship of food to growth, maintenance and repair of tissue on the one hand and to disease on the other have entirely replaced older theories, some of which are very vague or are of the type of "old wives' tales," and Nutrition has taken the centre of the stage.

Many of the clinical problems that daily face the physician have a direct relationship to nutrition: the recovery of patients from acute or chronic disease is dependent on the restoration of normal processes of digestion, assimilation and excretion; and the science of nutrition has much to offer in the way of securing such restoration promptly and effectively.

The physician has often to deal with another important class of individuals in his practice, such as those that consult him presenting signs and symptoms pointing to disturbance of the digestive or metabolic processes. In the same category come people who seek advice in controlling body-weight for physical or social reasons. Less frequently there may be individuals who look to the physician for advice in a personal nutritional programme as the means of health-building.

To meet the needs of all these adequately the physician must supersede the quack, the magazine column of advertisements and the Radio Broadcast as a source of nutritional guidance.

This end the physician can accomplish by becoming

lysine, tryptophane and tyrosine) which are essential for the manufacture of the body-proteins, that protein is absolutely useless to the body. It has been found that, as a rule, animal proteins (with the exception of gelatin) contain a large quantity and variety of amino-acids suitable to form the body-protein, while vegetable proteins have considerably less. It, therefore, follows that animal proteins contain better nutrition than vegetable protein.

[What is known as the *Biological value* of foodstuffs is applicable only to proteins. By the term is meant that property of proteins by which they can replace the wear and tear of the body; thus, when we say that proteins of milk have a high biological value or that the proteins of wheat have a low biological value we understand that milk protein can supply the requisite material for growth and repair at a lower figure for intake than can the proteins of wheat. Proteins of low biological value, have, therefore, to be supplied in much larger quantity than proteins of high biological value in order to meet the demand of the cells. All animal proteins have a high biological value and all vegetable proteins have as a rule, a low one.]

The common cereals like rice, wheat, millets and barley do contain a fair proportion of Proteins; but of all cereals rice is the poorest in the matter of proteins. In the case of rice and wheat the outer layer of the grain contains the largest percentage of Proteins and salts of calcium, iron and Vitamin B, so that when they are *highly milled* these substances are lost from the grain. Milled rice, therefore, loses some of its proteins, but most of the salts and practically all the Vitamins. Hand-pounded rice is, therefore, much richer in respect of proteins and also salts than milled rice; and hand-pounded parboiled rice is richer than hand-pounded raw rice.

In the case of the wheat also, the outer layers of the grain are rich in salts (Ca. P. and Fe.) and Vitamin A, B_1 and B_2. Hence whole wheat is a much better article of diet than the refined wheat flour—white flour or American flour; and wheat is in all respects (in respect of pro-

Dates, Raisins, Figs do contain a large amount of "sugars"; sugars contribute nothing other than mere calories or heat-units to the system. Wherever possible less highly refined forms of sugars such as *jaggery* and *molasses* should be used, since these are rich in Ca, Fe and even contain some Vitamin A. *Sweet toddy* contains only sugars in solution and is not intoxicating unless fermented. *Honey* is a form of sugar (invert sugar) obtained from flowers and is a good substitute for sugars. (Invert-sugar is a mixture of equal parts of Dextrose and Levulose and is obtained from canesugar (sucrose) by boiling with the addition of an acid). *Starches* are forms of carbohydrates present in foodstuffs such as grains (cereals and pulses), roots and tubers (Potatoes, Tapioca, Arrowroot, Sago, Yams and Colocasia) and nuts. Starches are purely of vegetable origin and their grains (starch grains) have an outside covering of cellulose, which forms the basis of the woody fibres of plants.

As starch is insoluble in cold water there is no risk of its being washed away by water or rain if the plant should be injured; but when boiled in water the cellulose covering becomes softened and ruptures and the starch grains become gelatinised, in which state only they are digestible by the human stomach.

Unripe fruits are hard and woody from the presence of a cellulose-frame work; in the process of ripening the acids in the fruit aided by the heat of the sun effect a softening of this frame work with partial or complete solution of the cellulose fibres, the product being the sweet soft ripe fruit.

Starch is really made up of minute grains, which under the microscope present various shapes depending upon the plant or fruit or tuber from which it is derived.

The glucose in the blood serves as a source of energy to meet immediate demands, and as quickly as this glucose is used up more is set free in the blood from the glycogen in the liver and other body tissues. Thus, glycogen serves as the second line of defence being always available to boost up the blood sugar. Persons engaged in strenuous exercise for many hours without food may

or Cambu, Soyabeans, Almonds, Bengal gram, Cashew-nuts, Groundnuts and Walnuts do all contain a varying amount of fat and of Vitamin A, B_1 and B_2 also.

Fats are insoluble in water, but pass from the solid to the liquid state at moderate temperatures. They consist of compounds of C, H and O, (that is why they are called Hydrocarbons,) but no Nitrogen in their pure state. They are, therefore, non-nitrogenous (unlike proteins), and as the greater portion of our body tissues like muscle are nitrogenous, fats by themselves are incapable of sustaining life long.

D. WATER

Water enters into the composition of all the animal tissues including bone and constitutes about two-thirds of the entire body weight. Even bone contains about 50 p.c. water. Water supplies fluid for the secretions, digestion and metabolism (tissue activities), also for transfer of food constituents and helps in the elimination of effete material. It plays an important part in heat-regulation and next to air is the most necessary principle of life.

Under normal circumstances the amount of water in the body remains the same even though the intake of water may vary considerably. If the intake of water is increased the blood pressure in the renal blood vessels rises and the secretion of urine increased; but if the amount of water is decreased thirst is produced, to quench which more water has to be taken in. Thirst is a demand of our system that the water intake should be increased. It is, therefore, advised except under exceptional circumstances (such as high blood-pressure) that the body should receive a liberal supply of water. It keeps kidneys and the skin active and serves to dilute any extraneous matter accumulated in the blood, which might otherwise irritate the kidneys especially and bring about their disease; poisons of fevers and disease, excess of sugar or salt contained in the blood are thus washed out of the system mostly by urine and to a lesser extent by sweat. This is the reason why fevers, diabetes or intake of a large quantity of salt or of alcohol produce thirst,

nuts are comparatively poor; and overmilled rice and white wheat-flour are very poor.

Hence, when our food consists largely of cereals such as wheat, rice, cambu, ragi etc., and even with meat diet there is always the need to take plenty of milk, vegetables and fruits to secure the necessary amount of salts. This point will be further referred to when we come to discuss the defects of the Indian Dietary and the means of correcting them.

Experiments have proved that if an animal is fed exclusively on a diet of *Salt-free* materials it dies within about 20 days, more quickly in fact than if it were completely starved. This is explained by the fact that the reserve of salts and water normally present in the body-tissues is all drawn upon, when no salts are supplied to the body through food.

As a rule all foodstuffs in nature containing salts in plenty are rich in Vitamins also, and as already remarked the absorption and assimilation of salts is advantageous to the system only in the presence of Vitamins, especially Vitamin A, C, and D. Thus, fat fish contains Vitamin A and D and Iodine; yolk of eggs, Vitamin A and D and Iron; liver, Vitamin A and Iron; cheese and milk supply Vitamin A and Calcium and Phosphorus; water-cress or greens (amaranthus) yield Vitamin A and C and Iodine and Iron.

Before we finally leave off the subject of "neutral salts" we might refer to one important use of these salts in the treatment of certain diseases. We mentioned that one of the functions of these salts, especially those of Sodium, Potassium and Calcium is to keep up the alkalinity of the blood and the tissues. Now in certain forms of fevers, rheumatism and gout, there is a tendency for the natural alkalinity of the blood and tissues to diminish, and such conditions are usually met by the administration of plenty of water with fruits and vegetable juices and complete avoidance of meats.

It may be pointed out here that almost all the salts are soluble in water. This is an important point to remember, as in cooking vegetables most of the salts do pass

found it to be very imperfect and instituted improved rations with complete success.

Beriberi was until recently a terrible scourge in the Malaya States, was often seen among coolies at sea-ports and had broken out in an Asylum at Dublin. Improvement of the quality of food in the prisons of the Strait Settlements had failed to limit the disease.

The outstanding peculiarities of the incidence of Beriberi in the Strait Settlements, was that while the Tamils were exempt, the Chinese suffered severely. Rice is the staple food of both the races but with this difference, *viz.*, that the Tamils used parboiled rice while the Chinese used husked white rice. The Chinese are extremely prone to Beriberi, while the Tamils very seldom suffer. This cannot be due to any racial peculiarity as the Tamils in prison fed on the same rice as used by the Chinese also suffered. The substitution of parboiled rice for polished white rice in a Siamese prison brought down the death rate from 113 to 0 in 1930.

The immediate relation of Beriberi to Vitamin B, was first pointed out by Dr. Eijkman, a Hollandish doctor who made a special study of Beriberi in the Dutch East Indies, and his work obtained for him the Nobel Prize for 1930.

Vitamins, however, are not quite unknown to Hindus; the ancients had evidently known by experience about the existence of these food elements and their importance in the matter of good health, although they were not able to demonstrate their chemical or Biological nature now made possible by modern means. The use of sprouted green gram (Phaseolus radiatus) and the tender greens of the Agasthi Keerai (Sesbania grandiflora) and Ekpani (one leafed shrub-ondalaga-Hydrocotyle Asiatica) has long been prevalent among the Hindus as the most essential means of breaking the fast of Ekadashi the next morning. So also the use of leavened preparations like *Surnalies* and *Iddalies,* varieties of sponge cakes.

At present there is evidence of the existence of only six Vitamins, usually represented by the letters A, B_1, B_2 (or G or P.P.), C, D and E (or X) respectively and

of diet being that the rice that was used was the parboiled hand-pounded variety from their own paddy fields and not the milled rice that is largely used in the Delta-areas of Tanjore and the neighbouring districts of Trichy and Cuddalore. The author has made a note of these observations in his "Ophthalmic Surgery and Sight Testing" published in 1926, and pointed this out to Dr. Aykroyd when the latter visited the Calicut District Hospital on the 30th March 1936. Dr. Aykroyd, however, made the observation that the inflammatory condition of the mucous membranes of the eye, the mouth and the throat was possibly the result of Vitamin B deficiency also as the condition improves, he said, by the internal administration of brewer's yeast, which is rich in Vitamin B_1 and B_2. It must be added here that most of these cases had some sort of chronic dry itch—another sign of malnutrition commonly met with among the famine-stricken people of the Ceded districts. This, however, confirmed our theory regarding this form of eye disease, that it is a form of deficiency disease with lowered power of resistance to infection. In fact, almost all those cases referred to above fell an easy prey to the Pandemic of post-war type of Influenza of 1918 having suffered in the last stages from acute affection of the kidneys with complete stoppage of urine and uraemic coma, and terminal broncho-pneumonia.]

(4) Regarding the anti-infective power of Vitamin A, we have the following observation of Sir Robert McCarrison: "Fertility, the course of pregnancy, of labour, resistance to infection following labour and lactation, are all adversely affected by defect in the quality of food; still births and maternal mortality are also some of the results of defective dietary.

"We might well accept this guidance readily with regard to our women and urge insistently that the mothers of our race be fed with knowledge and understanding."

Following these observations of McCarrison, two lady Doctors of Bombay, (Dr. Balfour and Dr. Talpade)

which privation and extraordinary feats of strength and endurance are taken as a matter of course, testifies to the adequacy of this diet; and medical evidence has demonstrated the absence of scurvy and rickets and no increased tendency to vascular and renal disease.

The Labrador Eskimos who have more dealings with whites have largely abandoned their primitive methods of existence; dried potatoes, flour, tinned goods, cereals and cereal products form a considerable part of their diet. Their meat is cooked and though Labrador is not truly Arctic, vegetables cannot be grown. As a result scurvy, rickets and a combination of the two are universal and severe.

(*Dr. K. M. Shenai of Mangalore has found out that cashew contains nearly 6 to 8 times the amount of Vitamin C as is contained in oranges. Paprika, a variety of cayenne pepper also contains 4 times Vitamin C as is contained in lemons*). (See under gooseberries)

The antiscorbutic value of milk depends to a large extent on the fodder of the animal yielding the milk.

The diet of nursing mothers requires a generous supply of this Vitamin also.

Vitamin C is easily destroyed by drying or canning. Cooking vegetables especially in the presence of alkalies destroys it; none-the-less it is probable that where the potato is the staple diet as in Ireland, it is the main source of Vitamin C for working class families, and it will be realised that the great Potato famine in Ireland was immediately followed by an out-break of scurvy.

Even Pasteurisation of milk requiring much lesser temperature than boiling destroys Vitamin C, and it is for this reason orange juice or tomato juice or other antiscorbutics are given to children fed entirely on Pasteurised Cow's milk.

The Vitamin C contained in curds or butter milk is not destroyed by boiling, the presence of lactic acid evidently saves it from destruction.

It is now generally agreed that *scurvy* is produced from lack of Vitamin C from food. The disease was described occurring in the Army of Crusaders as far back as

as far as protective foods are concerned the diet may be termed "physiologically sound."

G. ACCESSORY FOOD FACTORS

In addition to the various food elements including vitamins and salts and water, which are absolutely essential for healthy nutrition numerous other substances, which we call "food accessories," have come to be utilised in the dietary of civilised nations; they are not absolutely needed for nutrition but their use is only to give attractiveness to the food, make it appetising by increasing the flow of saliva and the gastric juice. They are classed under spices and condiments used in the culinary art and are contained in certain oils that give pleasing colours and taste for food and include things like pepper, mustard, salt, asafetida, coriander etc.

Stimulants like tea, coffee, cocoa and alcohol are mostly used for purpose of stimulation and pleasure, and with the exception of cocoa and alcohol they have no nutritional value whatsoever except through the small quantity of milk and sugar added. [Cocoa used in the preparation of chocolate is derived from Theobroma Cacao and has nothing to do with cocoanut; cocoa contains a small quantity of fats, proteins and carbohydrates, the active stimulating principle being "theobromine"—allied to caffiene of coffee and thiene of coffee and tea. In the quantity usually consumed cocoa, coffee or tea has no energy value either.

H. ACID-BASE FOODS

The body is an acid-producing organism and there is a constant demand for basic substances for the purpose of neutralisation and excretion of acids; the mild alkaline reaction of the blood should be maintained, the activity of the excretory organs result in a small but constant loss of basic elements. To meet this drain the body draws on the "alkaline reserve" of the tissues. As the store of basic material is *not unlimited* it should be made good by food alone. Hence it is necessary for us to balance or neutralise the effects of acid-forming foods taken in.

in large amount in muscles and in relatively small in bone and fatty tissue it is clear that the supply of proteins should be adequate for building new tissue during growth, pregnancy and lactation, convalescence from severe illness and in muscle-building or athletics-training, and provision should be made for tissue "wear and tear" of life processes. Proteins are, therefore, the most indispensable constituent of diet and without protein life is impossible.

Using the customary ration of an average labourer as a basis, Carl Voit on observations on German-labourers considered about 4 oz. of proteins per day a satisfactory amount; while Chittenden in America by studies on himself and a large group of students and soldiers fixed about 1½ oz. as the optimum quantity. He thinks that indulgence in larger quantity of proteins imposes a needless strain on the liver, the Kidneys and other organs involved in the metabolism and elimination of the end-products. Mc. Cay discussing the correlation of Protein-intake with health and vigour and material progress of certain tribes in India does not agree with Chittenden and favours a definitely higher concentration of proteins in the diet. Bogert sums up the question when she says "the best concensus of scientific medical opinion now seems to have settled upon an intermediate view, *viz.*, that there are certain dangers inherent in taking either a very high or a very low protein diet over long periods and that the inclusion of a moderately liberal amount of proteins in the diet is a factor of safety, to give the maximum growth and sustained vigour."

A safe range would, therefore, seem to be that advocated by Mc. Carrison, which is 90 to 100 grammes (3 to 3½ ounces per day).

2. *Quantity requirements of Carbohydrates.* Carbohydrates are the most abundant and cheap source of energy. They are classed under sugars and starches. Although they cannot be stored in any great quantity by the body they can be transformed into fats and be held in reserve. About 350 to 450 grammes (10 to 15 oz.) is said to be the average daily requirements of an adult

condition, apart from any voluntary muscular movements or mental activity, there is required *a definite minimum heat-production*; this is known as the Basal Metabolism or Basal Metabolic Rate, which is written as B.M.R.

Now the origin of the heat which constitutes B.M.R. is this: If the vital equilibrium is to be maintained certain vital organs like the heart and the lungs, the organs of digestion, liver, kidneys and the glands must continue the characteristic activity even when the voluntary or the skeletal muscles are at comparative rest; infact, the B. M. R. represents the *minimum heat production of the body at the time of complete muscular and mental rest 14 to 18 hours after the last meal.*

During sleep, therefore, the B. M. R. is at its lowest.

Now, the B. M. R. is influenced by certain other conditions than sleep, such as age, sex, state of nutrition, presence of disease, external temperature and the extent of surface-area of the body. Now the larger the surface area of the body the larger is the amount of heat lost from the body by evaporation or conduction or radiation; on a hot day, therefore, the B. M. R. should necessarily be less than on a cool day, and that explains the enervation and lassitude of the summer heat.

The B. M. R. has been estimated at about 1800 calories a day in male adults and 10 p.c. less or about 1740 calories in female adults; and as the surface-area in children is much less than in adults the B. M. R. in growing *children* should necessarily be *relatively higher* than in adults.

The B. M. R. depends upon also the state of nutrition of the subject, and the reduction of the body weight to 10 to 15 p.c. below normal by restriction of the food-intake results in very considerable reduction in the B. M. R.

Temperature. It is common experience that when the external temperature is low, there is an increased muscular tone until spasmodic muscular contractions, which we call shivering, occur, and muscular activity inevitably causes increase in heat production. In certain fevers the

work thrown on the various organs concerned, *viz.*, those of digestion and of excretion of waste materials from the body. Physiologists have calculated that the daily loss of Carbon and Nitrogen from the body amounts in the case of an adult doing ordinary work to:

Carbon—280 grammes
Nitrogen—22 grammes

1. Now let us suppose that a person chooses to live on *meat* alone; we know that one lb. of meat contains 40 grms. of Carbon and 12 grms. of Nitrogen; in order, therefore, to obtain the necessary amount of Carbon (280 grms.) he has to consume not less than 7 lbs. of meat: such a quantity is not only too large to be digested but contains about 84 grms. of Nitrogen, of which (84—22) or 62 grms. is a waste and should throw an extra strain on the excretory organs, the kidneys especially.

2. Next let us suppose a person to feed on Bread alone; one pound of bread contains 135 grms. of Carbon and 4·5 grms. N.; and in order to obtain the necessary quantity of Nitrogen to replace the daily waste he would have to take about 5½ lbs. of bread; but this weight of bread contains about 720 grms. of Carbon. In this case the man would be compelled to take more than double the quantity of Carbon required in order to supply the necessary weight of Nitrogen. This, again, not only throws an extra work on the stomach and kidneys but is a large waste itself economically also.

But it is possible to take such a "mixed" diet of bread and meat as to supply all the necessary amount of C and N and at the same time *without any waste.* In doing this we also reduce the total amount of food taken.

Thus 2 lbs. Bread (containing 270 grms. C and 9·0 grms. N)
and ¾ lbs. meat (,, 30 grms. C and 9·0 grms. N)

would give a total of 300 grms. C and 18 grms. N; in other words, by adopting a "mixed" diet we have not only to consume 2¾ lbs. of solid food daily but are enabled to make good all the waste of the body taking an excess of 20 grms. of C only. This clearly shows the advantages that may be gained by a mixed diet, which is selected with due regard to the daily requirements of

in amount but are poor in quality. So this defect should be put right in the same way that it has to be put right for wheat; with these differences, however, that there is twice as much protein in wheat as there is in polished rice and that the proteins of wheat are* *better*(?) than those of rice. So we must make up the quantity of proteins as well as their quality. This we can do by taking 3 or 4 oz. of dhal in addition to the green leafy vegetables, *and* milk or curds or meat or eggs, which we have learnt it is necessary to take with wheat. Infact it has been found that a diet of home pounded rice, dhal, vegetables with a small amount of animal proteins, preferably milk proteins, is almost unassailable from the point of view of modern ideas of nutrition and is further suitable in the tropics.

(b) Rice does not contain enough fats and therefore, the rice diet must be taken with butter, ghee or vegetable oils, the first two being much the best because they contain Vitamin A, in which rice is very deficient.

(c) The great fault of rice is that it contains so little Vitamin B; this deficiency being greater when rice is milled and polished or when it is parboiled and much washed. So we must select some food or foods which will provide the Vitamin B in which rice is lacking. By far the best way to do this is to substitute *atta* (whole wheat-flour) for one quarter to one-half of the rice ordinarily eaten; the atta contains much Vitamin B and besides this it increases the quantity and quality of the proteins in the food. But many people in the South and East of India cannot get *atta*, so the next best thing to do is to take Dhal with the rice: One part of dhal to every 5

* *This is the opinion of McCarrison, but Prof. Subramanian of the Biochemistry Department of the Indian Institute of Science, Bangalore in the course of an article contributed to the "Hindu" of the 22-3-'38 says: "There is ample experimental evidence to show that rice-protein small as it is in quantity is nutritively superior to that of wheat. It is richer in regard to the essential amino-acids, and taken in equal-weight-basis promotes better growth than wheat-protein. Unfortunately the present taste is such that even the small quantity of protein is largely rejected in the form of bran and only the residue is eaten."*

supplement to the diet of the poorer people can be provided at a low cost, and as we shall see later, certain varieties of fish available in Indian waters are particularly rich in Vitamin A.

A cod-liver oil substitute prepared from shark and saw-fish liver oils combined with groundnut oil is being prepared in Travancore, Malabar and Bombay, and as far as the Vitamin A fraction is concerned the replacement of the foreign cod-liver oil (Norwegian) by the locally produced fish-liver oils has now become a practical and economic proposition.

Value of Milk.—Calcium is found abundantly in milk, and rice is very deficient in calcium, and there is evidence that insufficiency of calcium is one of the most important defects of the rice-eaters' diet.

It is desirable that children should consume upwards of 8 ounces of milk a day. If funds do not permit the addition of this quantity of whole milk, then butter milk or skimmed milk (reconstructed from skimmed milk-powder) may be supplied; even this smallest quantity of milk is better than no milk. Careful experiments have shown that the giving of 8 ounces of skimmed milk daily to children fed on an average "ill-balanced" Indian diet results in an acceleration of growth and greater improvement in their health and well-being. Such an addition is not very costly and is now being supplied in a considerable number of Children's Homes in this country to the great benefit of the children.

Now there seems to be a practical difficulty in increasing the production and consumption of milk in our Country, and Nutrition Experts advocate the increased production and use of green vegetables instead, which, they say, like milk contain valuable quantities of salts and Vitamins A and C, and should necessarily be cheaper and more plentiful. But even of the green vegetables there is, no doubt, under-consumption in this Country as practically of every other nutritive article of food; and with regard to the green vegetables, one additional factor which seems to militate against their greater consumption is the general belief that whatever is cheap is necessarily of inferior

sures, also hold practically the same opinion as the Technical Commission of the League of Nations, and defines fresh milk, butter, eggs, meat and fish, fruits and vegetables as the best foods and stresses the value of a wholesome quantity of milk in the case of pregnant women and nursing mothers.

It will, thus, be evident that all basic knowledge of Nutrition is in essence the same in every country, and although extensive research in this direction has been carried out in recent years and greater knowledge of the science of Nutrition continues to be disseminated, it is Sir Robert McCarrison that can be said to be the first to observe the need for the simplification of such knowledge for the benefits of the lay public. His book "Food" published in 1928 (Macmillan, Price As. 12) while Director of the Nutritional Research, Pasteur Institute, Coonoor, (S. India), embodies the results of his research in Indian Food values and local problems connected with nutrition. It specially deals with the manner in which those results should be applied to the peculiar problems of inter-provincial conditions in India in respect of food-supply and income-distribution and needs created by climatic, racial, religious and social peculiarities.

McCarrison's investigations were mainly directed towards diets typical of the various classes of the Indian population, and we have already seen how he favours the typical diet of certain races of Northern India, which combined in it all the necessary elements of a well-balanced diet and which has contributed towards the most remarkable physical stamina and power of endurance of these races. We have also seen how he points out the other extreme, the ill-balanced nature of the Madrassi diet, both of the rich and the poor.

A similar Publication to McCarrison's is the Health Bulletin No. 23 (Government of India Publication 1941 priced only 2 Ans.) prepared by Dr. Aykroyd, Sir McCarrison's successor at the Nutrition Research Institute, Coonoor.

ERRORS OF DIET

A. Over-feeding. This seems to be the commonest

nutrition seems to be without danger to health even when extended over some months. But when extended over years, as happened in Germany during the War, the general effect appears to be a diminution in the power of resistance to diseases like Tuberculosis; the effects of insufficient feeding in diminishing resistance to cold has already been alluded to; its effects in producing liability to disease in general were well illustrated in the outbreaks of relapsing fever and typhus which followed the potato famine in Ireland in the early part of the present Century, and similar results have repeatedly been witnessed in India and elsewhere, "fever and plague dogging the footsteps of famine."

It is common experience that exposure to infection is especially apt to be dangerous on an empty stomach, as, for example, before breakfast, a fact which it is important for Doctors and Nurses to bear in mind.

The Tubercle bacillus seems to find a peculiarly favourable soil in ill-nourished persons. The association between bad feeding and such a disease as "consumption" is well established, while an improvement in nutrition is not infrequently followed by a cure.

The bad effects of underfeeding in children have been to restrict growth, and experiments on animals have shown that a return to normal conditions has been followed by an *increased* rate of growth, sufficient to make up for that lost during the period of underfeeding; and the fact that the bad effects fall heavily on the young and the growing has been recognised even from the days of Hippocrates, who devoted a special aphorism to the statement of it. "Old men" it runs, "bear want of food best; then those that are adults; youths bear it least, more especially children, and of these the most lively are the least capable of enduring it."

The remote results of under-feeding are not less injurious than its more immediate results. Amongst such results, impairment of the digestive power is very conspicuous, and a kind of disuse-atrophy of the digestive organs is the result and is often seen in dyspeptics. The more their nutrition fails through not eating the less they

mechanism. Fear, worry, disgust, anger or pain may stop or reverse the movement of the digestive tract, or they may even decrease or suppress the secretions. On the other hand, we may have a psychic increase in tone, activity or secretions brought about by good mental states. In this field is to be found the explanation for many of the puzzling problems of digestive and nutritional disorders.

Application of these facts to the hygiene of diet consists in a careful study of the emotional states of the patient in relation to the intake of food; in the case of grief or anger it is common experience that the appetite is checked. Social surroundings of the home, school or business may compel the taking of food under stress or haste with its attendent problems, and discovery of the cause and the substitution of good mental states will be followed by favourable effects on digestion and nutrition.

Food—likes and dislikes, the environment in which the food is served, its preparation as to appearance, taste odour may influence the digestion by either improving or retarding it. A good deal thus depends upon the way in which the food is presented to the eye—a clean table cloth, decorated with flowers and pleasant cheerful surroundings make all the difference. In fact the sight of a dirty table cloth or plate might check the flow of the gastric juice itself and spoil the appetite. These factors should always be considered, and no supervision of diet is complete that neglects these factors.

* * * * *

Fatigue has an untoward effect on digestion, for it directly influences both the character of the muscular movements and the extent of the digestive secretions. The question, what influence have exercise and rest on digestion is probably one of blood supply of the stomach; gentle exercise by increasing the rapidity of the circulation may aid the secretion of the digestive juices and stimulate the movements of the stomach and intestines; but severe exercise by diverting much blood and nervous energy to the muscles has probably an adverse effect.

Sleep is only useful as an aid to digestion in the case of invalids and aged persons, but even in them it may be

in a tall cylindrical glass vessel, the cream collected should not be less than 1|10.

Skimmed milk. Now, fat exists in milk in the form of an emulsion of extraordinary perfection. When milk is allowed to stand the fat being lighter, we said, rises to the top as *cream.* If this is removed "skim-milk" is left. While whole milk contains about 5 p.c. of fat, skim-milk contains only 1 p.c., and if the cream is removed by means of a centrifugal separator a larger percentage of fat goes with the cream leaving only about 1|3 p.c. in the skim-milk. Skim-milk is therefore, digested by the stomach much more easily than whole milk.

As soon as milk enters the stomach it "Coagulates" or "clots" due to a change brought about in the casein by the ferment, 'rennin' contained in the acid gastric juice. After the clot of casein is formed in the stomach it shrinks into a leathery mass, offering great resistance to digestion. The thicker the milk (i.e., the greater the quantity of solids contained in it) and the greater the acidity of the gastric juice, the denser the clot becomes, and the greater is the difficulty of digesting the milk.

"Clotting" of milk as taking place in the stomach, has to be distinguished from "Curdling" of milk occurring in Nature by the action of a special ferment converting the milk into curds and changing the sweet lactose (milk sugar) into the sour lactic acid. When milk "curdles" its casein is simply thrown down in the form of a precipitate without undergoing further change, (but when milk 'clots' the casein undergoes certain changes which renders its digestion more difficult). Hence it is that curdled milk is more easily digested than milk itself.

The production of lactic acid is due to a splitting up of the lactose contained in milk by the agency of certain organisms (Bacterium lactis) normally present in milk, the growth of which is facilitated by certain external conditions, of which warmth seems to be the chief; that is the reason why milk readily turns sour in the hot weather. If the milk is boiled these bacteria are killed, such a milk keeps better and longer without turning sour. Boiling or

for the removal of pieces of dead bone may be necessary and even amputation of a limb.

There are no statistics of the mortality of Tuberculosis and such lists as we possess do not by any means reveal the truth. Not all people who suffer from Surgical Tuberculosis die from it, though all who die from it have as a rule suffered miserably for months or years. The deprivation of health, strength and vigour which occurs in both forms of Tuberculosis lays the patient open to attacks of other infections to which he falls an easy victim, and to this new disease death is usually ascribed, though Tuberculosis opened the gates for the entrance of the new and fatal disorder.

Many of the cripples we see in the streets, those with bent backs and warped limbs owe their miseries to infected milk; those with thick, swollen and perhaps suppurating necks, called "scrofulous" from their resemblance to the pig, and those whose hips and knees are twisted or stiffened are also the victims of a disease which may be conveyed to man from the cow.

OTHER DISEASES CONVEYED BY MILK

Though Tuberculosis is the most insidious and dangerous of the diseases transmitted from the cow to man by infected milk, it is not the most dramatic. Several cases of septic fevers believed at first to be Influenza were finally traceable to milk. Several epidemics of scarlet fever have been traced to milk-borne infection. Epidemics of diphtheria, typhoid fever and cholera could often be traced to infected milk; and the list could be continued. But although these acute epidemic out-breaks of disease caused by milk are disturbing and attended not only by grave morbidity but by a small mortality, they are negligible in comparison with the permanent serious problem of Tuberculosis.

The problem, therefore, is not so much with the value of milk, about which there are no two opinions, as with an increased supply of milk and that *above suspicion*, i.e., which carries no disease germs with it. Now, how is this to be secured? The problem of milk supply is in part an

have a disagreeable odour about them; this may be true in respect to the male animals but the female is absolutely free from any disagreeable smell. Moreover, in most of the Hindu houses the cow is reared in preference to the goat, as the cow is held by them in great reverence as the Kamadhenu.

The properties of goat's milk compared with cow's milk give it a distinct advantage.

1. In the first place, goats are not subject to Tuberculosis, so that their milk may be said to be free from suspicion of that taint. It is clear, then, that this immunity possessed by goats should be transmitted through their milk and that it accounts for its beneficial effects when supplied to tuberculous children. Goat's milk is, therefore, not only free itself from tubercle bacillus but also possesses *special immunising* properties.

2. It is generally known that goat's milk is more digestible than cow's milk and that children fed on it *never vomit hard curds* as they do when given cow's milk, but what they bring up is of a flocculent nature like the vomit of a child fed on the mother's breast-milk.

3. The nutritive value of goat's milk is quite equal to and in cases of wellfed goats much superior to that of cow's milk.

4. The digestibility of goat's milk is demonstrated beyond argument when supplied to delicate and weakly children.

5. Goat's milk, though devoid of vitamins of any sort, may have some medicinal value in it, as the goat unlike the cow, eats all sorts of herbs and leaves, some of the active principles of which may find their way into the milk. It is strange that the goat which does not object to eat even the bitter leaves of Nux Vomica has great aversion to the common Vasaka plant, which is therefore known in Malayalam as *Aduthoda,* i.e., the herb which "the goat does not even touch."

Hence the goat should more generally be used as the source of milk supply in rural parts and especially at Sanatoria where the more able patients could be employed in looking after them, gaining experience thereby in the

growth of organisms in the cream during "ripening" or during fermentation of the milk, as butter prepared from sterilised milk or pasteurised milk is devoid of flavour.

Butter is mostly fat and is rich in all the vitamins of the milk and contains a small percentage of water and a trace of casein in it; and butter cannot therefore keep indefinitely without getting rancid; but when butter is converted into ghee by heat all the water is driven off and the casein becomes burnt. The vitamins of the butter are not affected by boiling and mostly retained in the ghee except Vitamin C, in which even the butter itself prepared from boiled and curdled milk is wanting.

Buffalo's milk is largely used in the preparation of butter and ghee as it is much richer in fat than cows' milk.

Butter-fat being in a state of fine emulsion and having a low melting point is very easily digested and assimilated more or less completely; butter consists of butyric and other fatty acids; some of which are quite soluble in water, while others (such as oleic acid) are not soluble in water, but all are akin to fat present in the animal body. The ease with which butter is digested and the completeness with which it is absorbed marks butter as a superior source of fat, even to cod liver oil, for the dyspeptic and the invalids of consumption and other wasting diseases; the diabetic do, therefore, derive immense benefit from its use. This quality of butter is lost in the ghee evidently from the mechanical changes brought about by high temperature.

COMPARATIVE FUEL VALUE OF BUTTER AND JAM

The relative fuel value of Butter and Jam as an addition to the dietary is of considerable importance to the poorer sections of the community and involves really two questions, the question of nutrition and the question of cost.

Now, Jam consists mostly of refined sugar and so far as nutrition is concerned, jam can, theoretically, take the place of butter, but the quantity of jam will have to be roughly as much as 3½ times the quantity of butter to yield the fuel value of a given quantity of butter, as butter

diarrhoea is the result which easily follows in case of Typhoid especially.

There is also the risk of certain irritating fermentation-products being formed in such preparations; and this fact should be noted by physicians and parents, who often suggest such preparations to patients.

GAMES

Wild rabbits eat all varieties of aromatic herbs and roots and their flesh is, therefore, considered to have great medicinal value and is immensely used by Ayurvedic physicians in the preparation of certain specifics especially for Tuberculosis and other wasting diseases. The flesh of rabbits used as article of food is said to be easily digested and is prescribed for invalids and people with weak digestion.

FISH

Proteins and fats are the chief nutritive constituents of fish, just as they are present in meat, but fish contains more of P and is more easily digested than meat; and is for this reason frequently recommended, especially the white fish—which is fancifully described as "the chicken of the sea"—to the dyspeptic and the convalescent.

Fish, as already noted above, is poor in the "stimulant extractives" of the meat and forms a good substitute for meat in the diet of the epileptics and of the old.

The popular belief that fish is valuable as brain food is founded on the supposition that it is rich in P; but there is no scientific evidence in favour of this belief.

Fish-eating was once thought to produce liability to certain skin affections, especially leprosy and this property was particularly attributed to "salted fish." This theory is now exploded and even in prominent skin-clinics and Leper Asylums fish diet is still continued.

Fish is a cheap and nutritious article of diet among the poor especially in the coastline districts.

Fish is apt to decompose rapidly in the hot weather and has to be gutted and packed in salt or ice to prevent early decomposition. Fresh fish is firm and stiff; while

The various food ingredients, *viz.*, Proteins, Fats, Carbohydrates generally as starch, mineral salts and vitamins and even water are all fairly represented in the cereal grains, but Carbohydrates preponderate, so that cereals form the staple article of man's food all over the world except in the Arctic regions, where plant life is not possible from extreme of cold.

The chief Carbohydrate contained in cereal is starch which makes up to 65—70 p.c., and small quantities of sugar are also met with, but cellulose is not abundant except in their outer covering. Hence cereals are more easily digestible.

The great preponderance of Carbohydrates in cereals and their comparative deficiency in fats and proteins and vitamins indicates that cereals should always be eaten with other foods richer in fats and proteins like milk and eggs, and substances like bread should be eaten with butter or cheese.

The proteins vary considerably in kind in different cereals and their value as true proteins varies also. They average about 10—12 per cent.

The proportion of fats varies in different members of the group and it is interesting to note that those cereals, such as Oats growing in the colder climates of northerly latitudes are richer in fats than the cereals of tropical growth like the rice, so much so fat is almost absent from rice. In this respect the cereals seem to be governed by the same Natural Law which, as we said, provides a milk supply specially rich in fat to the young whale or the young walrus of the Arctic regions, so that the young cereal also, which has to grow up in cold climate, may be supplied with an abundant store of fat.

In addition to Oats, Bajra or Cambu, Millets and Ragi contain a fair percentage of fats; but they contain a lot of fibrous matter also in addition.

In respect of minerals like Ca, P and Fe all cereals contain a fair per cent (2 p.c.). In this respect cereals resemble animal foods; thus ragi, bajra, wheatbran and oats contain a large quantity of Ca and P, while Fe is

Ca, P and Fe salts and Vitamin B than the white rice. (See Table.)

Nevertheless it is the prevailing fashion to go in for the nice-looking pearly white milled rice in preference to the coloured but more nutritious and more sustaining hand pounded rice. Man is a blind follower of fashion and does not consider that colour and beauty are after all skin deep; and so it is in the case of rice, white American flour and also in the case of refined white sugar, which, as we have seen, are much lesser articles of diet than their crude forms.

Parboiled rice is more easily liable to attacks by weevils and has a greater tendency to grow musty than the overmilled white rice unless it is properly stored.

Parboiled rice takes longer time for digestion than the white rice. This gives the poor labourer a better sense of fulness and satiety than the white milled raw rice. Rice after manufacture is liable to certain changes especially when stored in a damp place and becomes acted on by microbes and ferments, which as a rule do no harm, but on the other hand improve its digestibility and taste, perhaps by partial conversion of the starch into sugar. Under certain conditions, however, harmful microbes may get access to the rice giving rise to formation of certain poisons without much change in the naked eye characters of the grain.

It is, therefore, necessary to avoid the mistake of calling two samples of rice as "being the same" merely because they have come from the same source or they are of the same kind.

MILLETS

These comprise a large class of cereals including scores of varieties of cholam (bajra or spiked millets) ragi, Italian and Indian millets (varagu) and maize. They form the staple food of nearly 40 p.c. of the population in South India. The total area under millets cultivation in India is over 60 million acres, and in the Madras Presidency alone over 13 million acres, which exceeds the area under rice cultivation in the Madras Pre-

quantity. About 6 varieties are grown in India, their composition does not differ much from that of the millets.

WHEAT *(Triticum vulgare)*

There are about 12 varieties grown in India, extensively cultivated in N. India up to the Gangetic Delta, in S. India, the whole of the tableland above the Ghats and in the Himalayas and Tibet; is a staple article of food where rice is not common. It is the best of all the diets used by the Indian races if taken as wholewheat flour (Atta). The chemical composition varies a good deal, the average being:

Proteins,	12 p.c.
Carbohydrates,	53 to 70 p.c.
Fats,	2·0 p.c.
Salts	Fair amount.
Vit. A, B_1 & B_2	Fair amount.

(Wheat is used in 3 different forms: Suji, maida and atta. Wholemeal wheatflour is "**atta,**" and the white wheatflour is "maida").

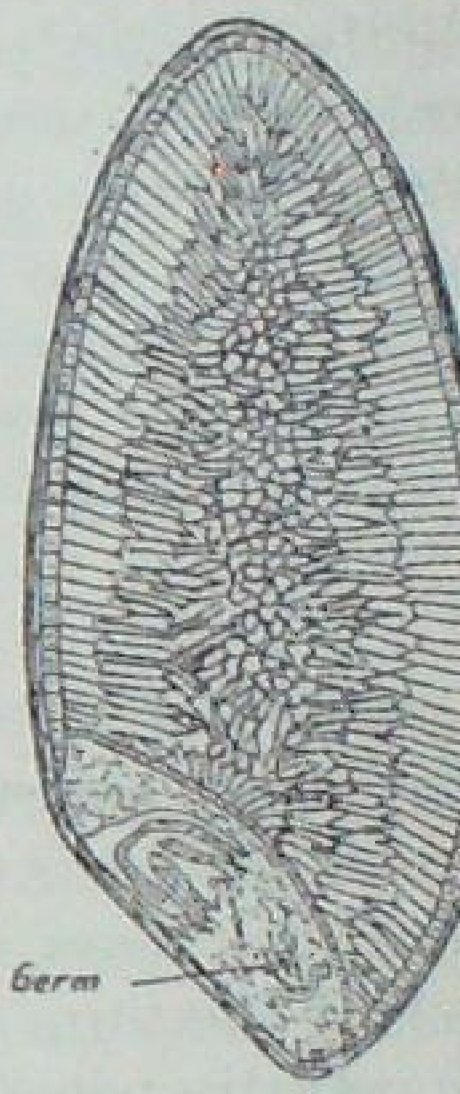

Fig. 3
Section of wheat x 60

If a grain of wheat is cut into thin slices and examined under the microscope it is found to consist of the following parts: (*Fig. 3*).

(1) The germ or the embryo—which is the beginning of the future plant and forms about 2 p.c. of the entire wheat grain.

(2) The endosperm or the Kernel—This consists of large masses of nutritive material (gluten) for the use of the embryo and makes up about 84 p.c. of the entire grain.

(3) The bran—an outer protective covering of the grain formed of cellulose impregnated with a good amount of mineral salts; about 14 p.c. of the entire grain is *bran.*

Each of these parts of the grain contains all the ingredients of the entire grain; but the germ is characterised by its *richness* in Proteins, Fat and Vitamin E (especially

FIELD BEANS *(Dolichos lablab)*
Mochhai Kottai—Tamil

The green pods and seeds (green or dry) are used as vegetables; they contain Protein 17·1 p.c., Carbohydrates 57·4 p.c., and Fat 2 p.c. and are absolutely devoid of vitamins except of course when the grains are sprouted.

GREEN GRAM *(Phaseolus radiatus) (Mung)*

Mung contains 24 p.c. Proteins, 1·26 p.c. Fat and 56·69 p.c. Carbohydrates, a large amount of Fe and Ca salts and fair quantity of Vitamin A, B_1 and B_2. Vitamin C is abundant only in the sprouted grain, which forms an important element of diet among the orthodox Hindus to break their *Yekadasi* fast the next day. Green gram is an excellent laxative and diuretic and is a bland soothing diet in piles, especially when inflamed.

HORSE GRAM *(Dolichos biflorus) (Kulti)*

It is a nutritious food for the poor, but being difficult of digestion is better borne if taken as meal or flour after dry frying. The gravy of the baked grains as given to horses is very nutritious and has an inviting flavour, and when seasoned with garlic or asafetida forms an appetising soup before a large meal and can be served with butter or ghee.

LENTILS *(Lens esculenta)*

Is the most nutritious of the pulses with the exception of soya beans, having in it a large proportion of Proteins, Carbohydrates and Vitamins A, B_1 and B_2, but poor in the matter of fat and mineral salts and sulphur, although it is fairly rich in Fe. Lentils are more easily digestible than either peas or beans and are less apt to cause flatulence also.

PEAS *(Garden Peas) (Pisum sativam) Battani*

Is eaten either green and baked, or dried, baked and roasted. Green peas cooked in the usual manner contain only 16 p.c. carbohydrates of which a considerable proportion is sugar.

(2) A broader layer inside the skin, called the fibro-vascular layer, forming about 10 p.c. of the total bulk.

(3) The flesh of the potato, forming about 89 p.c. of the total bulk of the potato.

The fibro-vascular layer being considerably richer in mineral matter and protein than the flesh of the potato, if the rind is peeled off in the raw state, a portion of the fibro-vascular layer also comes off with the rind, which means that we lose those valuable ingredients to a large extent.

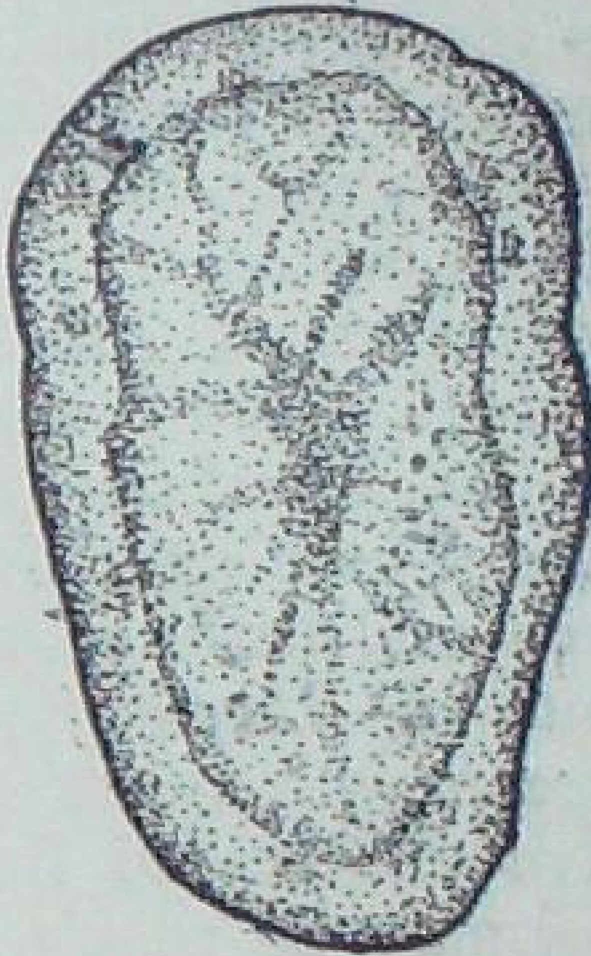

Fig. 4.
Potato

The "flesh" of the potato consists mostly of starch and nitrogenous elements and salts in solution in its juice. It must be realised that by no means all of this nitrogenous matter is present in the form of Proteins; in fact the protein-content of potato is very low, and most of the nitrogenous matter is present as "asparagine" which has no nutritive nor tissue-building properties. One is, therefore, apt to greatly over-rate the value of potatoes as tissue-building food.

The richness of potato in starch is its most striking chemical characteristic and causes it to be one of the chief commercial sources of starch and dextrin.

The starch grain of Potato is of specially large size, but unless cooked is not easily digested and absorbed and causes flatulence. Owing to their readiness to undergo fermentation potatoes do not form good food for the dyspeptic.

The most important mineral ingredients of Potatoes are salts of Potash, Calcium and Phosphorus, and potatoes are one of the chief sources from which we obtain our supply of these salts. Potatoes provide a large amount of Vitamin C; they also yield more Vitamin B and Iron than milled cereals.

tains the volatile oil noted above. It contains arsenic in minute quantity. An alcoholic tincture of garlic is useful in cases of intestinal and lung tuberculosis and as a local application to inflamed glands from any cause. Garlic is reputed to reduce *blood pressure* and is a tonic in chronic skin diseases.

RADISHES *(Horse-radish)*

(Armoracia radix;—raphanus sativus)

Two varieties are common, white and pink; both contain a large proportion of water (90—94 p.c.) and a small amount of Carbohydrates and a volatile oil giving them a pungent taste. Used in medicine as a Carminative and is a good laxative in cases of piles.

COLOCASIA *(Colocasia antiquorum)*

(Shembu, Shepa kananga) consists of:

Proteins	3 p.c.
Carbohydrate	22 p.c.
Fat	Trace.
Fe	2·13 p.c.
Vit. A, B_2 and C	Small amount.

Most varieties contain a mucilaginous principle allied to pectin, and sometimes an alkaline substance which causes itching of the mouth on swallowing even when cooked. Such things have to be cooked peeled with acid stuff to get rid of this irritant.

The stem and leaves of colocasia are also used as green vegetables and have a nice laxative effect. Some varieties contain Fe also in the stems and leaves. It forms the chief vegetable in the diet of mothers soon after delivery, probably the Vitamin A has a beneficial effect in the prevention of puerperal septicaemia.

Colocasia leaves are used in the preparation of Patra-vadai, a baked form of sandwiches prepared with green gram or Bengal gram and considered a delicacy. Colocasia stems and leaves of particular varieties are prescribed by Indian Vaids and Hakims in bleeding piles and some forms of skin disease.

(3) Green vegetables are also valuable sources of Fe in the diet. Thus, amaranthus and cress, Fenugreek (methi bhaji), Indian sorrel (gongur), bitter gourd, cluster beans and peas, drumsticks are fairly rich in Fe. The stems of amaranthus are often humorously named "iron-bars" on account of the presence of Fe in them.

(4) Certain organic acids are present in green vegetables. Thus, sorrel, rhubarb and ginger contain oxalic acid, tomatoes and green mangoes contain citric and malic acids etc.

(5) Several vegetables contain *mucin*, a sort of gummy albuminous matter capable of sparing the protein tissues of the body and preventing body waste.

(6) Vitamins. Green vegetables are an important source of Vitamin A, B_2 and C, especially Vitamin C, to the presence of which their antiscorbutic value is mainly due; and there is no doubt that some of the benefits derived from their use in health are due to the presence of several vitamins.

Most vegetables can be used uncooked to retain the vitamins and should be well washed with clean water before eating. To retain their salts and proteins vegetables should be first well cleaned with water and then sliced, the cut pieces should never be washed but be directly steamed; if boiled the gravy should not be thrown off. Potatoes are therefore, best cooked entire and in their skins, and fruits stewed entire without being sliced.

LEAFY VEGETABLES—GREENS

Amaranthus—3 varieties are commonly used as vegetables.

1. Amaranthus Gangeticus—*Tandukeerai* (Tamil) *Dantu* (Telugu).
2. " Spinosa—*Mullukeerai*. *Thottakkura; Kantanatza.*
3. " Viridis—*Kuppaikeerai, Chilakathota Koora, Golibhaji.*

Gangeticus contains a lot of Vitamin A, B_1, B_2 and C and Fe and Ca salts.

Garden Cress (Lipidium sativum) resembles amaranthus in respect of nutrients and mineral salts such as

hydrates and forms a delicious vegetable for the table. Its nutrient and vitaminous contents are very little.

Brinjals (Solanum melongena) (Egg fruit) contains · p.c. carbohydrates, trace of proteins, of iron and vitamins. There are several varieties cultivated in India. The smaller varieties are nicknamed 'gentleman's toes' as opposed to lady's fingers, the bendekai.

A big round delicious variety is the one grown in South Canara particularly at Matti, near Udipi, which is practically a delta formed by a mountain stream. They are easily cultivated, are good bearers and form an important economic article of diet for 4 to 6 months in the year.

Kandankathri (Solanum xanthocarpum)—Kalyant, a small thorny variety, bitterish in taste makes delicious dish. Although not digestible in itself on account of its thick skin and abundance of seeds they excite the flow of saliva, are useful stomachics and aid digestion. Their nutritional value is very little. They are given even to feverish patients.

Sundakai (Solanum torvum) is found to contain a good amount of carbohydrates, proteins, a fair proportion of Fe, Ca and P and Vitamin A. Is very much in use in Tamil districts and is recommended as a digestive tonic for the weak and the anaemic.

Tomato (Lycopersicum esculentum) contains both while green and ripe:

Proteins	1·88 p.c.
Carbohydrates	4·57 p.c.
Iron salts	2·37 p.c.
Fat	Trace
Ca & P salts	Trace
Vit. A, B & C	Fair quantities.

The acidity is due to citric acid.

Lady's Fingers (Hibiscus esculentus)—Bendekai—Okra—contains a fair amount of Proteins and Carbohydrates, Ca, P and Fe salts and Vitamin A, B_1, B_2 and C. The mucin contained in them is a tissue-sparer. Bendekai forms an ideal vegetable food for the weak and the invalid and those suffering from neurasthenia, Beriberi and sleeplessness.

a high proportion of Carbohydrates (45 p.c.) along with a fair amount of protein (6·6 p.c.) and fat (8 p.c.). The great value of the chestnut has been fully recognised by the poorer peasants of Central France, who make during the autumn and winter two meals a day from chestnut alone. The nuts are prepared by removing the outside shell, blanching and then steaming the kernels; milk and salt may be added if necessary; or the nuts are ground after blanching and the meal made into flat cakes like chappathis.

Hazelnuts (filberts) are also nutritious and have the following composition:

Proteins	8·5 p.c.	Approximately.
Fat	27·5 p.c.	
Carbohydrates	12·0 p.c.	
Water	rest	

Sweet Almonds. (Amygdala dulcis) are yet another very valuable form of nuts being specially noteworthy for the large amount of Protein (20·75 p.c.), fat (58·9 p.c.) but Carbohydrates only 10·5 p.c. contained in them. They contain a fair amount of Fe, Ca and P and Vitamin B, and have a high caloric value. They have the further advantage of being compact and portable. "No man" it is said, "need starve on a journey who can fill his waist-coat pocket with almonds."

A bland edible oil can be extracted from almonds, which is used medicinally and for toilet purposes on account of its demulcent properties.

**Cashew nuts.* (*Anacardium occidentale*). This is a native of Brazil and is evidently an introduction into India from the West, as its botanical name indicates and is widely cultivated all over the West Coast of India and extensively in Africa. Cashew nut is a great favourite among the "nut-eaters" in America and Europe, and India is one of the few countries of the world that export cashew-nuts in very large quantity.

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* The seed is very curiously placed outside the flesh, or in common parlance— "The nut which grows on the outside of the fruit."

oils are the only chief fats they can depend upon for sustenance.

To remove rancidity of edible oils.

Prepare a solution of soda bicarb 15 grammes in 100 c.c. of water. This makes a 15 p.c. solution. For every 4 ounces of the oil put in 3 drams of this solution, mix well by shaking vigorously and set aside for 24 hours preferably in the sun. Decant the top layer, which is entirely formed by the refined oil.

Another method is by putting in a small quantity of powdered common salt and shaking vigorously and setting aside for 24 hours and decanting the supernatant oil.

(F) FRUITS

"To us a diet of one exclusive fruit meal and one hearty mixed meal seems to be ideal for civilised men." McCarrison.

The fruit is not of direct benefit to the plant, it is intended as a bait to attract birds and insects and so insure the liberation and transport of the seed. Hence the aesthetic qualities (beauty, color, sweetness and flavour) predominate in fruit, rather than the strictly nutritive, and we eat them more for the sake of their sweetness and flavour than for the actual nourishment which they afford. Fresh fruits in general have the following composition:

Water	85 to 90 p.c.
Protein	0·5 p.c.
Fat	0·5 p.c.
Mineral matter	0·5 p.c.
Carbohydrates	6 to 12 p.c.
Cellulose	2·3 p.c.

It will be evident from the above that the only nutritive constituents of any importance in fruit are the Carbohydrates. These consist almost entirely of sugars as there are few ripe fruits that contain any starch.

The chief sugars present in fruit are fructose and glucose (=grapesugar) and in most fruits these are present in nearly equal proportions. Apples and Pears, however, contain much more fructose than glucose; whilst in most stone-fruits, on the other hand, glucose predomi-

Mineral matter ..	2·5 p.c.	0.5 p.c.
Moisture ..	13·0 p.c.	13 ·8 p.c.

It will be seen that banana meal is richer in carbohydrates and mineral matter than wheat flour but much poorer in proteins. If rice, on the other hand, had been taken for comparison it would have been found that banana flour is about equal to it in nutritive value. It is made into a sort of bread and flat cakes and is easily digested.

"Bananina" is a proprietary food obtained from the banana and is designed for the use of Infants and Invalids and contains about 4 p.c. more carbohydrates than banana flour but is stated to be easily digested.

One important advantage of banana is the cheapness with which it can be produced. It has been found by experience that a given area of ground devoted to its cultivation will yield a larger food-return than if it were planted with potatoes. The bread fruit, the sugar cane and chest nut, however, exceed the banana in their food-yield per acre.

Surpassing even the banana in nutritive value is the group of dried fruits, such as, dates and raisins, figs and prunes.

The date is indeed as much a staple article of diet to the Egyptian as rice is to the Hindu, but the carbohydrate of rice is mainly in the form of starch, while in the date the carbohydrate is almost solely present as sugar, which is much more readily digested and more completely absorbed than starch.

Dates (Phoenix dactylifera) contains the following:

Protein	3·04 p.c.
Carbohydrate	67·31 p.c.
Fat	Trace
Iron	10·58 p.c.
Vit. A, B_1 & B_2	Good quantity
Vitamin C	Trace

and a high caloric value.

Dates form a good dessert after a mixed meal.

Indian Dates (Phoenix sylvestris) Ichapalam. Bastard Date. They are a very poor imitation of the

There is a variety, which is very sour and is used as an astringent in diarrhoea and dysentery.

The root bark of the tree has an active principle, which has a vermifuge effect on tape-worms.

Wood apple (Feronia elephantum)—Kapittha, vilapalam—has good flavour, is nutritious and is a good laxative.

Sapota (Achras sapota)—Chukku fruit—is a sweet nutritious fruit having laxative and diuretic properties.

Country plums (Zyziphus jejuba)—Badari—have a big seed and thick skin but little pulp. The pulp is not easily digestible and causes windiness.

Tamarind (Tamarindus). The word derives its origin from Tamar, an Arabic word meaning dates, and Ind meaning Indian.

The pulp contains:

Carbohydrates	65·0 p.c.
Protein	3·2 p.c.
Iron	10·5 p.c.
Vitamin A	Good quantity
Vitamin C	Trace

Tamarind is a good laxative, also useful in chronic constipation.

Tomato fruits (Lycopersicum esculentum). The ripe tomatoes are included among fruits, contain little nutrition but a fair amount of Vitamin A, Vitamin B_1 and Vitamin C. Tomatoes are good diuretics. Tomato juice can be given to children and infants after each feed and acts as an antiscorbutic against infantile scurvy.

SUGAR

There are several varieties of sugar entering into the composition of all sweet articles of diet.

(1) Cane sugar (Sucrose) is commonly derived from the sugar-cane, the beetroot, the American Sugar Maple and the bastard date; but although when derived from other sources than sugar-cane and special names given, such as beetroot sugar or maple sugar it must be distinctly understood that all the sugars are chemically identical.

cold water and applied as a plaster it produces a rubefacient effect on the part and relieves deeper inflammation and pain.

Pepper (Piper nigrum). Pepper is a common condiment used in the place of chillies. It is a good diuretic and useful antipyretic and is a common household remedy for influenza and common cold. It is an antiperiodic also and is commonly taken as "Tea" at bed time as a preventive against Malarial fever. Pepper contains small amounts of Vitamin A and Vitamin C.

Cubebs (Piper cubeba)—Gandha menasu.

Poppy seeds—Kaskas—are commonly used in some forms of drink; contain Vitamin A and B_1 and C.

Omum (Carum copticum)—Ajowan. Is a good carminative and antispasmodic.

Turmeric (Curcuma longa) is used for its characteristic flavour and yellow colour. It is a good intestinal sedative and disinfectant.

Vitis—perandai—a creeper, quadrangular in section, containing a lot of mucin, used in the preparation of pappadams.

Betel leaves (Piper betel) are powerful aromatics and oral disinfectant and deodorant. They excite the flow of saliva in the mouth and indirectly that of the gastric juice when chewed after food. Betel leaves contain a large quantity of Vitamin A but only a trace of Vitamin C.

H. BEVERAGES

1. *Water.* When water is taken alone or on an empty stomach it almost at once begins to flow into the duodenum, the process going on in repeated gushes through the pyloric orifice, and the time taken by one pint of cold water has been found to be about 40 minutes; with warm water, however, this time is considerably less. This is because heat increases powerfully the movements of the stomach wall and at the same time seems to "unlock" the pylorus so as to facilitate the escape of the fluid; the stomach is, thus, washed clear of its contents as it were. With this purpose physicians often prescribe, in cases of chronic dyspepsia with dilatation of the stomach and in

mote the process of digestion by causing an earlier and more abundant secretion of gastric juice; moreover CO_2 acts as a stimulant to the movements of the stomach and thus aids in the mechanical process of digestion also; and the bubbling of the gas through the food contained in the stomach facilitates its disintegration.

But there are cases in which mineral waters or aerated waters are considered harmful. In dilatation of the stomach the mechanical distention of the stomach with gas tends to hamper the action of a weak heart by causing the fundus of the stomach to press up against the heart.

Unfortunately it cannot always be said that aerated waters are germ-free, as CO_2 is not fatal to microbes of disease, except perhaps the cholera bacillus, and that too only when under great pressure. But only water obtained from Artesian wells or filtered through efficient filters may be said to be germ-free.

5. *Distilled water* though free from germs and solid constituents has been found to have harmful local effects on the stomach when used alone as a drink especially on an empty stomach.

Sweetened aerated waters such as lemonade, gingerade etc., are apt to disagree with the stomach and produce fermentation and acidity both by reason of the acid they contain and the sugar or syrup. Such beverages, however, should not be supposed to be devoid of any food value, for, a bottle of the sweet drink usually contains about $1\frac{1}{2}$ ounces of sugar, having an energy value of 100 to 120 calories. Their refreshing influence in fatigue or on a hot day is explained by the presence of the sugar and the coolness caused by the escape of the gas, on opening the bottle.

6. *Ice.* Frequent use of iced waters or ice cream is supposed to be the greatest single factor in the causation of chronic dyspepsia. The cold contracts the blood vessels of the stomach and prevents the secretion of the gastric juice in proper quantity and curtails the movements of the stomach wall.

Water used for the manufacture of ice should be

earlier than tea or coffee, it is only of late years that it attained any wide popularity, evidently from the enterprise of its manufacturers. The chief ingredients contained in cocoa are:

Fat	—	25 to 30 p.c. or even more
& Proteins	—	20 p.c.

The chief active principle is theobromine, closely related to caffeine or theine, and cocoa contains about 2 p.c. of it; that is, about as much as there is caffeine in coffee.

Chocolate consists of cocoa mixed with white sugar and starch and flavoured often with vanilla. Free use of chocolates gives rise to dyspepsia and constipation especially in children.

* * * * *

The influence of these beverages on digestion is rather unfavourable on the whole; but the tannin and its bad effects are supposed to be neutralised by the addition of a few grains of bicarbonate of soda to the pot. These unfavourable effects are certainly minimised by the addition of milk.

Nevertheless it may be said that in health the disturbance of digestion caused by the infused beverages are practically negligible. But in cases where digestion is feeble these beverages are wholly unfavourable. In such cases tea may be said to be the worst, coffee is preferable to tea, and cocoa, provided most of its fat has been removed in the process of manufacture is preferable to either tea or coffee.

If tea is taken at all by reason of habit a good tea should be preferred, whichever variety contains the least tannin, such as Assam Tea or Ceylon Tea; it should be infused not more than 2 or 3 minutes and should be taken with milk. Only one cup should be taken and that too not on an empty stomach, but only as "after-noon tea."

Tea and Coffee are both to be avoided especially tea as they are all unnecessary stimulants of the nervous system, removing the sense of fatigue and are apt to produce sleeplessness. They are in no sense foods, as they have neither food value nor energy value, but people are gene-

burning logs of wood, or bury them in hot cinders just as we do our nuts or potatoes; later only the oven was invented and in its crudest form was a pit dug in the ground and lined with hard stones. When the stones have been heated by kindling a fire inside the oven the meat or fish is put in and covered with hot ashes. It seems that certain Brazilian tribes set up posts with a grating of branches across, on which they lay their game and fish over a slow fire burning underneath. This is called a "boucan" and it is said the pirates of the West Indies prepared their store of meat in this way; whence is derived the word "Bucca-neer" (=pirate).

This method of cooking meat is though crude, yet hygienic, as the scorching condenses and chars the outer albumins of meat and forms a water-proof covering, inside which the baking and softening of the meat goes on; the flavour and extractives are thus retained to their full extent, and the meat so prepared keeps long without decomposing.

It is interesting to note that the advantages of "slow" cooking were known even to some savage tribes, and in this respect even the civilised cook has to learn something from them; and no better illustration of this will be found than in the method of cooking practised by the Kanakas of the Friendly Islands of Oceania, otherwise called the Tonga Islands, near Figi and Samoa. A hole is scooped in the earth and a wood fire kindled and kept burning until a fair-sized heap of glowing charcoal forms; pebbles are then thrown completely covering the charcoal. The substance to be cooked, generally a joint of meat is enveloped in leaves, placed upon the pebbles and more leaves heaped upon it. The earth is then thrown back into the pit and well stamped down. A long time is of course required for the substance to be cooked through; but so subtle is the mode that over-doing is almost an impossibility. Even when removed after 2 or 3 days the cooked material will be steaming hot and retain the juices, the flavour and the salts. It is said of this method that no form of civilised cookery can in the least compare with it.

PART THREE

Disease, its Causation and Prevention

INTRODUCTION

In the study of all living organisms it is essential to bear in mind that there are invariably two general aspects of the problems connected with them; *viz.*, the living organism itself and its environment; the latter term includes every external stimulus that may impinge upon the body, such as air to breathe, water to drink, food to assimilate and indeed all the general physical and chemical conditions met with on this Earth.

A living organism is said to be healthy, when it is suited to its environment in such a way as to be able to react sufficiently to its demands without at the same time being injured. There is no exact criterion of health, and our idea of health, or rather the phenomenon of health, is based on the observation of a large number of healthy individuals; this conception of healthiness is not a rigid standard, as variations in the direction of either excess or defect may and do occur within certain limits without impairment, however, of health. When the reactions of an individual exceed the normal range we speak of the condition as *'disease.'* Disease is therefore, a failure of normal reaction, either of a temporary or permanent character.

The existence of disease becomes manifest outside by perceptible alterations in the condition of the sufferer and certain disturbed sensations—the *"signs" and "symptoms"* of disease.

Disturbances which attract the attention of the sufferer himself—such as pain, giddiness or nausea—are termed 'symptoms', while disturbances that can be observed by others,—as hardness or swelling of a part or abnormality in the sounds of the Heart or the Lungs, which can be heard on listening over them—are termed "signs." There is no essential difference between "signs" and "symptoms," as some of the disturbances may be perceptible both to the sufferer as well as to the observer—

by its symptoms and by its physical signs; and after death the localisation is justified by the discovery in that part of corresponding structure changes. This is "structural" or "organic" disease.

Diseases in which no visible physical or chemical changes are found are classed as Functional Diseases, under the belief that in them the functions of certain cells are abnormally performed without any visible structural change. But this conception involves an impossibility, as function of an organ or cell is merely alteration in its structure—gross or minute—in response to stimulus; consequently the same structure must under identical conditions always perform the same function. Hence the term 'functional disease' merely denotes morbid conditions of which the underlying structural changes are not obvious or have not been discovered.

The causes of disease are often classified into:

A. Predisposing causes,

and B. Exciting causes.

A. Predisposing causes are certain conditions acting upon the living organism so as to render it *susceptible to outside agents.* Thus, starvation or over-exertion may render a person susceptible to the attack of disease-germs, which would ordinarily be unable to settle in his tissues and cause disease.

While discussing the subject of Immunity we shall have occasion to consider the mode of action of such predisposing causes, and it is in fact mostly in reference to parasitic diseases that the distinction 'predisposing' and 'exciting causes' appears to have much meaning. But there are other conditions which also come under predisposing causes as they also influence the occurrence of the morbid processes. Thus,

(1) Age—Children are particularly liable to catch disease in general as the power of resisting injury or disease in them is not fully developed until the adult age, the condition of stable equilibrium has not been attained, so to say; further, the growing tissues of children are liable to certain affections which do not occur in adult cells, e.g., Rickets. In old age, on the other hand, the vital powers are wearing out and gradual loss of function is occur-

The presence of this parasite in the skin gives rise to intolerable itching, which is followed by violent scratching. Pus-producing microbes grow into the abrasions of the skin thus produced and give rise to pustular eruptions — scabies (itch). The parasite seems to have a special preference for the hands, feet and external genitals. The disease arises from prolonged contact with infected skin or clothing or tools.

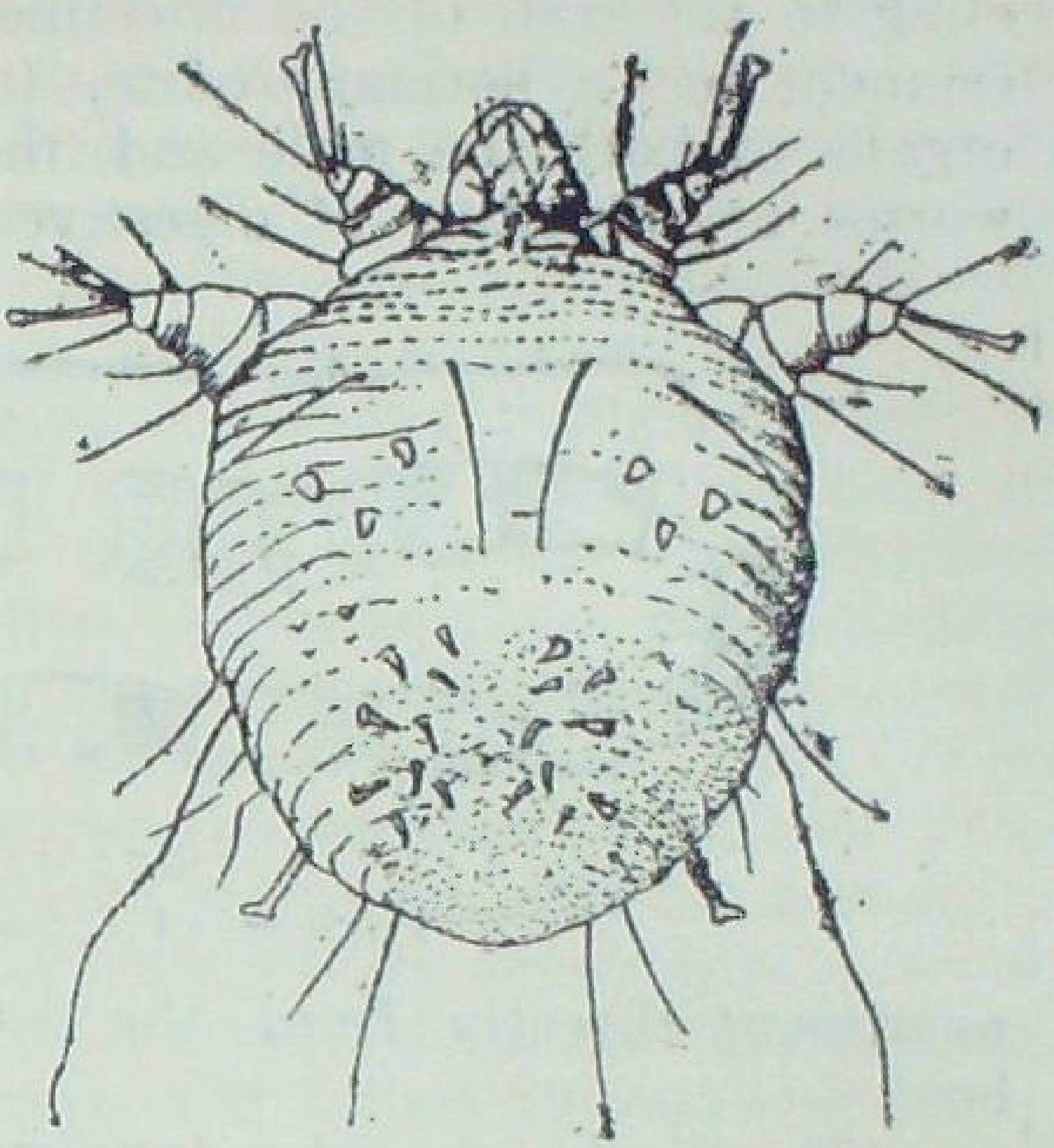


Fig. 6

Sarcoptes Scabiei (The itch mite) × 200.

The latest treatment consists in the application of a 30 p.c. emulsion of Benzyl Benzoate in soap solution—obtainable as Scabisol, Scabamide etc. The infected clothing should be boiled in order to prevent re-infection.

* * * *

The *Internal* parasitic organisms indigenous in man are the so-called "worms" inhabiting in their mature form his intestinal canal. They are: Tapeworms and Roundworms.

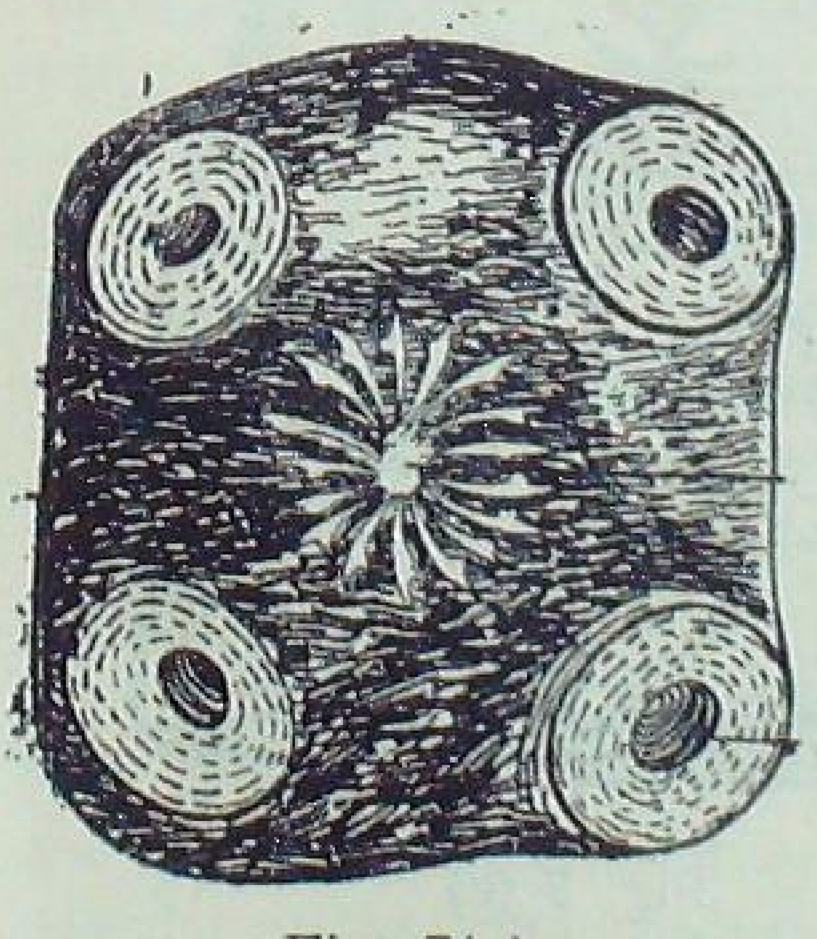


Fig. 7(a)

Head of the Tapeworm T. Solium with suckers and hooklets × 60.

A. TAPE WORMS *(Cestoda)*

Are long flat white tape-like worms consisting of a minute head and neck with a longer or shorter row of attached "segments." The head is about 1|25 inch broad

the male ones less than ½ inch in length. The head is provided with four hooks and two teeth. The posterior end is broad in both sexes, the male possessing an umbrella-like caudal expansion fitted with ribs and two long spicules.

The ova are oval, segmented and enclosed in a thin transparent capsule. They develop rapidly in muddy water and in mould especially if this is mixed with faeces,

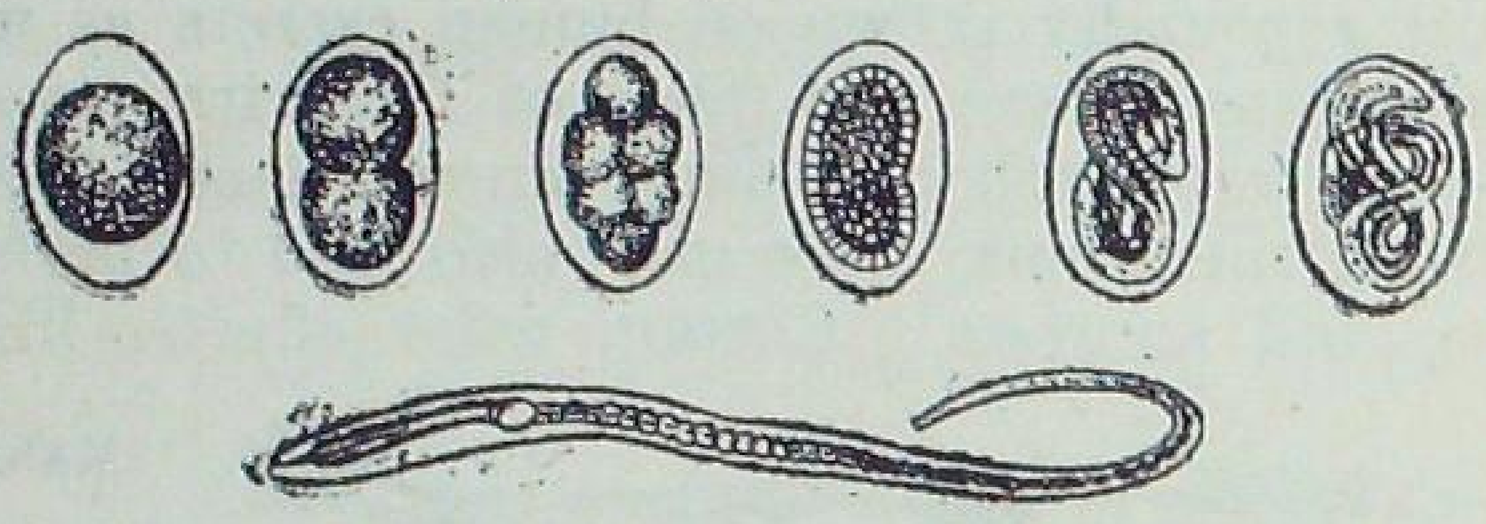


Fig. 8(a)

Embryo and Eggs of the Hookworm ×60.

where they liberate the larvae. In this stage the embryos can exist for months. The larvae may reach the alimentary canal of the new host in contaminated drinking water or through the agency of soiled hands or through the deliberate eating of earth. "Geophagi" is a morbid craving for eating earth and carbonaceous matter which sometimes developes in those infected by all kinds of worms.

Loos has shown that they enter the human host through the skin, generally the soft skin between the toes, causing a sort of itch—ground itch, as it is called. This mode of infection Loos discovered by accident in Egypt, he spilled a culture of the embryo worms on his hand and soon noticed a smarting sensation and actually saw the parasites penetrating the skin. The barefeet of labourers working in muddy water are quickly attacked. After entry the embryos are said to be carried to the lungs and to pass through the bronchi to the alimentary canal. It is in the intestines that the parasites attain sexual maturity. They take 5 or 6 weeks to form fully developed adults. They inhabit the duodenum and the jejunum in large numbers becoming attached to the mucous membrane by means of their hooks, and sucking the blood from the sub-mucous tissue.

appear in the superficial circulation gradually about 6 o'clock in the evening and are present in greatest number about midnight, and Manson has estimated that there may be about 50 millions of them present in the blood of a single individual at that time. They then gradually diminish in number and by 6 a.m. in the morning have completely disappeared into the deeper circulation, the lungs and the large arteries.

During the night some of the embryos might be removed from the blood by mosquitoes. If the infected individual changes his habits so as to rest by day and be awake at night the parasites also change their habits in the same way. The embryos which thus reach the stomach of the mosquito, pierce and escape from their sheaths and bore their way into the thoracic viscera of the mosquito, where they undergo further development; after this development the larvae pass towards the proboscis of the mosquito. When the mosquito bites—and it is always the female that is the "blood-sucker" and not the male—the larvae are injected as it were into the circulation of the host and the host becomes infected. In the host the larvae develop into the adult form and come to rest into the lymph channels. From this resting place the female discharges her embryos into the general circulation through the thoracic duct.

Manson in 1879 was the first to discover the culex fatigans as the intermediary host of the filaria sanguinis hominis.

In most instances of filariasis no effects are produced and Manson has shown that in the blood of even a healthy individual 50 millions of them may be present at one time, so that it is possible that in a large proportion of instances of Filariasis no effects are observed. But the commonest effects of filarial infection are:

(1) *Elephantiasis*—an enormous overgrowth of the skin and the subcutaneous tissue of the foot, leg, hands, male genitals, scrotum and breasts and female genitals, giving the part the appearance of the skin of the elephant —Elephantiasis Arabum (as distinguished from Elephan-

which might act as a nucleus for the formation of stone in the bladder.

The female worm is rounded, has the form of a thin thread, one inch long; the male is half inch long, of milk-white colour, flat and curved laterally so as to be slightly concave on the ventral side. During sexual intercourse the curve increases, so that the opposite sides meet to form a canal in which the female is enclosed.

The ova are small and in shape they are generally compared to a melonseed being pointed at one end (spiked) and enclosed in a transparent membrane, through which often the elongated embryo can be seen.

S. Mansoni and S. Japonicum are other members of this group—with very similar structures and life histories, only these are smaller than S. Haematobium of Bilharz and their ova present a lateral spike. They infest the colon and rectum giving rise to symptoms of dysentery and sometimes of cirrhosis of the liver.

Historical. The most widely distributed urinary form of the disease, Schistosomiasis, is known to have existed in Egypt even 3000 years ago and Ruffer found the characteristic spiked ova in ancient Egyptian mummies. Bilharz discovered the parasite in 1851 in Cairo; other workers like Manson, Leiper and Looss identified some of the varieties in Africa and the far East.

While the Author was a student in the Madras General Hospital in 1902 under Col. C. Donovan, I.M.S. of the Kala-azar fame, a European soldier, who had just returned from South Africa after the Boer War, was admitted in the Hospital for haematuria. His urine was centrifugalised and the sediment examined by the author under the microscope, and the characteristic lateral spiked ova were detected. The case was then diagnosed by Col. Donovan as one of Bilharziosis. But in 1903 Manson found similar lateral spiked ova in the faeces of patients from West Indies and identified them as a separate genus, which now goes by the name S. Mansoni.

Bacillus Coli. staphylococci and diphtheroid bacillus are of common occurrence.

The nostrils serve as a filter for inspired air, and the bacterial flora found there include varieties of cocci and bacilli; in the throat streptococci and staphylococci are found even in the absence of any obvious signs of disease. The alimentary canal presents a highly complex bacterial flora; in a normal healthy person the stomach is comparatively sterile (free from bacteria) owing to the presence of hydrochloric acid, but the lower intestines contain an enormous variety of bacteria like B-coli, which are present in large numbers in addition to other forms, like the bacillus mesentericus and the various spore-bearing bacilli, which latter are concerned indirectly in the digestion of food stuffs like cellulose in man.

The types and number of these bacteria are liable to great variation and to a great extent with the diet. The relative proportions of various organisms are variable and these organisms are compatible with a normal state of health; they are however, *potentially* dangerous, that is, dangerous under particular circumstances of *deficiency of vitality* in the host: e.g., B-coli in the intestine is non-pathogenic and causes no disease, but it may occasionally become pathogenic as a result of imperfect nutrition, exposure to cold, interference with the blood supply of an organ or part of organ and some other conditions in the body of the host. Under such conditions the B-coli is capable of producing disease, such as inflammation of the urinary bladder, of the peritoneum and other structures in the neighbourhood of the intestines.

Streptococci in the mouth and throat may similarly cause harm and may give rise to endocarditis (inflammation of the inside-lining of the heart) and arthritis (inflammation of joints).

Many other bacteria which occur normally about the body may similarly be potentially pathogenic, i.e., may bring about disease only under the lowered condition of the body of the host.

Pathogenic bacteria mostly live outside the body and then gain entrance into the body of the host. When they

settling once for all the question of spontaneous generation not only served to orient the question of origin of life but also the nature of infectious disease; in other words "not only does each living cell come from a previous cell of the same kind, but each instance of infectious disease comes from a previous instance of the same malady." There may be an exception to this rule, *viz.*, that a non-pathogenic organism might, as we have seen, under particular circumstances take on pathogenic characters; this, however, does not invalidate the rule.

Living disease-agents, we have seen, leave the body of the host in one of several ways, depending upon their characteristic location in the body of the victim: Thus, (1) the causative agents of Respiratory diseases such as Tuberculosis and Pneumonia are present primarily in the diseased lungs and are discharged through the sputum; (2) the specific bacteria of Cholera, Dysentery and Typhoid fever are discharged with faecal matter; (3) the specific Filtrable virus of scarlet fever, "Flu," measles, cerebrospinal meningitis and some other diseases are discharged with the nasal secretions.

Typhoid bacilli have been known to have been disseminated by the *urine*. *Milk* may serve as a mode of exit of Tubercle bacilli and streptococcus from the cow, and of the organism of Malta-fever in the goat. In some forms of septicaemia like bubonic plague, in malarial fever, in filariasis and trypanosomiasis, relapsing fever etc., the respective causative agents are present in the blood, and although under natural conditions infected blood does not serve as a means of exit from the diseased individual, they may be removed by blood-sucking insect-vectors and transmitted to a new host. Sometimes during the post-mortem examination of cattle dead of anthrax the spilling of blood on the ground often spreads anthrax bacilli in the soil, where it remains capable of producing new infections for a long time.

Now, bacterial disease-agents may be present not only in those suffering from disease, but, as we have noted, in those who have recovered from disease, but still retain the bacteria and may act as "carriers" of disease. Unfortu-

to continue its characteristic manifestation. In all instances there is a period of lag—or "period of incubation" as it is called—before the manifestations of infection appear.

Virulent septicaemic infection like bubonic plague, erysipelas have the shortest incubation period; for typhoid fever the incubation is a few days to 2 to 3 weeks; for hydrophobia 2 to 6 weeks; and leprosy requires months or perhaps years before it becomes evident.

In some cases the incubation period depends practically on the rapidity with which the agent reaches the area of manifestation and this in turn on the distance from such a focus of the place of original deposition and entrance of the microbe. Thus, in rabies a bite on the foot requires a long incubation period, whereas a bite on the face, which is nearer the Central Nervous System is followed by symptoms *without much delay*.

The incubation period is perhaps the period required for the microbes for multiplication and production of toxins in sufficient quantity as to give rise to symptoms of infection, and varies with the nature of the microbe and its degree of virulence and the degree of opposition on the part of the host.

The duration of the incubation period depends not only on the location, number and properties of the invading organism but also on the defence-properties of the host; infact symptoms of infection although primarily caused by the action of the microbes are directly due to the reaction of the host; this reaction is not immediate but depends on a "training period" on the part of the cells of the host, in order perhaps to prepare a "bacteria-splitting ferment" as suggested by some.

Course of Infection. The invading microbes, particularly as they multiply in numbers produce a series of harmful effects in the body of the host. They are of the nature of certain mechanical effects such as the (1) blocking of the small blood vessels, as occurs in the blood vessels of the brain in some malignant type of malaria (cerebral malaria); or (2) blocking of the small lymphatics as in Filariasis. Anthrax bacilli have also been known to produce such effects on the blood vessels. But the com-

Europe until 1721; meanwhile the method suffered from various vicissitudes partly due to actual dangers that were incurred in the procedure, and was finally replaced by the current method of vaccination introduced by Jenner in 1798.

Jenner was wise enough to recognise that in cowpox we have a disease which is simply small-pox of man adapted to another animal-species, namely the cow, and capable of producing in man a strictly localised lesion, recovery from which insured him from the more virulent disease, namely, the human small-pox.

We saw above that the most important immunity against an infectious disease is that conferred by an attack of the disease itself. Like other kinds of immunity, however, this immunity is only a relative one, for if through defect of food or clothing, want of rest, overwork or other unsatisfactory condition of life the general vigour of the individual be temporarily lessened he may fall a victim to a disease, which under normal healthy conditions of life he would have escaped. The degree of immunity varies much with the disease as well as with the individual. Thus chickenpox rarely attacks an individual a second time; with several other fevers a second attack is unusual though not rare; whereas one attack of Pneumonia seems actually to predispose to a later attack.

The symptoms of an infectious disease are due to great part to the action of the micro-organisms and their products on the tissues and also in part to the abnormal activity of the tissue cells. These soon succumb if the attack of the parasitic organisms is extremely severe; but if the reaction is less severe an energy, usually dormant or sluggish, wakes up in the tissue cells, and the tissue cells give rise to anti-substances or substances antagonistic to the invaders; moreover, whether these invaders be bacteria, chemical products of bacteria, or other foreign cells or their cell-products the healthy animal-body produces the anti-substance, which is specifically antagonistic to that particular kind of intruder.

These anti-substances are not to be regarded as entirely new productions on the part of the body, but as mole-

bility of the microbes to the action of the phagocytes. Thus, Sir Almroth Wright has described under the name of Opsonins (meaning purveyors) bodies which are normally present in blood serum and have the property, not of directly destroying bacteria, but of sensitising their protoplasm in such a manner as to render them (bacteria) a more easy prey to phagocytes.

The varieties of anti-substances that are evolved in the course of immunisation may therefore be said to be of the nature of:

(1) Anti-toxins.
(2) Bacteriolytic bodies—
 (a) Immune body.
 (b) Complement (alexin).
(3) Sensitizing bodies—or opsonins.

All these are normally present in blood serum.

Some anti-bacterial sera when added to living cultures of the particular organisms with which they have specific affinity, cause the bacteria to clump together. This clumping (agglutination) is due to an anti-substance known as '*agglutinin*' present in serum.

Agglutination is met with in connection with Enteric, Cholera, Malta-fever, Plague, Tuberculosis and Bacillary dysentery. It is often taken advantage of for diagnostic purposes, as in the Widal's Test for Typhoid fever and in the corresponding test for Malta fever.

THEORIES OF IMMUNITY

(1) *The Phagocytic Theory.* The important discoveries of Pasteur led to practical results of great significance and more important still, they led to speculation as to what could actually take place in an immunised animal; and both Pasteur and Koch made suggestions as to how the protection against infectious agents actually occurs; but those suggestions were later abandoned, and it remained for a Russian Zoologist, Eli Metchnikoff, in 1882 to develop the first completely adequate and still important reason for the resistance of the animal body to disease. Metchnikoff proved that certain cells of the body, first of all the Polymorphonuclear leucocytes (micropha-

ensued. Unfortunately as we have seen, the self-adjusting mechanism of the body does not give any signal of alarm, the greater the draft apparently the greater the supply.

The means by which man overdraws his surplus of vital force are many; such as exposure to cold, fever and anxiety, over-eating and starvation, over-exertion and want of rest and sleep and over-indulgence in stimulants and sexual excesses.

We see people apparently in good vigour accustom themselves to only a few hours' sleep during the 24 hours of the day, devoting the rest of their time to doing two days' work in one day. Owing to the wonderful provision of nature just referred to, apparently the more such a person demands of the organism the more there is at hand to respond. It is therefore quite possible that one in vigorous health may even for years habitually sleep one, two or more hours a day less than nature demands, or work for 6 or 8 hours more than is natural and wholesome, and still apparently be in good health. But when the day of reckoning comes or the poison of an epidemic enters such a system, there is not enough of vital reserve left to expel the intruder and in consequence collapse and death ensue. The individual himself or his friends have no suspicion of what the real cause of the breakdown was. Quite possibly another member of the same family may be exposed to the same infection but either does not have an attack, or if attacked is able to ward it off easily and make a quick recovery. A thoughtful person will easily see that where two are exposed to the same infection under the same environmental conditions that the one escapes with little or no harm, while the other succumbs, the reason is that the one has a large reserve of vital force and that the other has none, having over-drawn his account.

Whoever habitually therefore deprives himself of the natural amount of sleep and rest is lowering his stock of vitality, and the same is true of any one who indulges in overwork or any of the stimulants like alcohol, tobacco etc., or in sexual excesses, as all excesses are a distinct drain on the nervous system and on the vital force. Sexual Intercourse meant so much expenditure of vital energy

which are transferred from person to person or from animals to man:

Modern science has shown that communicable diseases are caused by definite and specific microbes (Bacteria, protozoa and spirochaetes), many of which have been isolated and the manner of their transmission from host to host determined. In many diseases although the causative organism has not been isolated its existence is inferred and the manner of its transmission surmised from the characteristics of the disease.

It has been established beyond doubt that infectious diseases never arise spontaneously, but that the causative organism is always derived from a previous case of the disease. The mere presence of organisms does not however, always produce the disease. Indeed, disease-producing organisms are often present in a person who shows no signs or symptoms of the disease because of the immunity towards it, but such an individual may serve as a "carrier" and transmit the disease germs to people who are not immune, with disastrous results. Thus, we find all degrees of severity in the disease produced by pathogenic organisms, and the most severe symptoms often accompany the disease in one person infected by the same organism, which in another produces scarcely any effect. We must conclude, therefore, that the spread and continuance of disease is possible:—

(1) By those who carry the germ without showing any symptoms of disease.

(2) By those who show symptoms that are so mild or so atypical as to prevent recognition even by experienced observers.

(3) By individuals during the stage of incubation,

and (4) By persons suffering from the fully developed form of disease.

The actual transmission of disease is accomplished in a number of ways. The causative germ may be shed off in the excreta of a patient as in typhoid fever, in the secretions of the respiratory tract as in diphtheria and scarlet fever, in the sputum as in Pulmonary Tuberculosis, or from sores as in the case of venereal disease and small-

A. THE MOSQUITO

Mosquitoes are readily distinguished by the two thin membranous wings densely covered over with scales on the surface and at the margins, and a long proboscis for piercing and sucking. The body is divided into 3 regions, the head, the thorax and the abdomen; the head has a proboscis, a pair of palpi and a pair of antennae (feelers). The eyes are compound, the thorax has three pairs of legs on the underside and a pair of wings dorsally. There are two minute halters which represent the rudimentary hind-pair of wings.

The male mosquito is recognised by the densely feathered bushy antennae, which in the female are nearly bald or thinly feathered.

Life history of the mosquito. The female lays eggs on water, which hatch in two days' time and minute wriggling larvae emerge out of them, the larvae feed on debris and floating matter in the water and grow rapidly moulting several times; after about the 10th day the full-grown larva becomes transformed into a pupa; two days later the adult mosquito emerges out of the pupa by bursting its back skin.

The egg, the larval and the pupal stages do all occur in water. The presence of water is, therefore, essential for the development of the mosquito.

Three kinds of mosquitoes are commonly known and they are:—

(1) Anopheles (Fig. 11) and Fig 11 (a), (b) and (c).

(2) Culex (Fig. 13) and Fig 13 (a).

(3) Stegomyia.

The Eggs. The eggs are cylindrical and laid singly or in masses of several eggs cemented together by a gelatinous fluid. The eggs of anopheles are laid singly and are provided with lateral air floats, which enable the eggs to float on water; the culex, however, lays its eggs in raft-shaped masses and the entire raft floats on the water. These egg rafts are characteristic of the culex only. Stegomyia eggs are laid singly and do also float on water though they have no air floats.

	Anopheles	*Culex*
1.	*Eggs.* Laid *singly* and have *floats*	Laid in *raft-shaped* masses, no floats.
2.	*Larva,* Floats *parallel* to the surface of the water; has no breathing siphon.	Hangs down from surface of water while resting; breathing siphon present.
3.	*Adult.*	
	(a) Attitude. Sits straight with the proboscis in a line with the body.	Sits hunch-backed with the proboscis forming an angle with the body.
	(b) Wings—Spotted	Of uniform colour.

The stegomyia is grouped under culex in the above Table. It is essentially a domestic mosquito and is easily distinguished by the brilliant black and white bands on its body and legs. It attacks man during daytime and breeds in collections of water in houses and nearby.

Mosquitoes are known to carry several diseases in man. E.g. the Anopheles are the transmitters of Malaria; and the Anopheles Maculipennis (spotted winged) is the best known malaria transmitting species; the Culex acts as the intermediate host of the worm, Filaria, (the cause of Elephantiasis in man) and transmits its embryos (microfilariae) contained in the blood of the infected person to another. The Stegomyia is responsible for the spread of Yellow fever and Dengue.

The variety of stegomyia known to transmit yellow fever goes by the name of Aedes Aegypti. It is a house mosquito as we saw, breeding not in swamps but in small receptacles of water adjacent to dwellings. This kind of mosquito is very common along the Mediterranean and the Black Sea, and the increased facilities for travel by aeroplanes and automobiles threaten the entire world with the danger of spreading Yellow fever from these parts.

It is important to remember that it is only the female mosquito that is the blood-sucker and not the male; and one important fact regarding these blood-suckers is that

into the mouth and vomit it out. During this regurgitation process the contents of the crop may be deposited on human food, and if the fly had just prior to this act fed on material contaminated with the germs of disease such disease could be produced in the consumer.*

The fly also frequently utilises its crop-contents as a solvent to solid foods such as sugar or candy. When this happens some portion of the crop-contents is invariably left on that material and this may account for much disease-infection.

The part played by the house-fly, better named "the filth-fly", in the transmission of typhoid fever, has been often exaggerated in the past, but it is nevertheless a real one. It was the experience of the American Troops in the Spanish War, which first forcibly called attention to the danger of transmission of disease by flies. About one in every five of the soldiers contracted typhoid during the active campaign. Reed and Vaughan, who studied this disastrous affair came by investigation to the conclusion that "the number of cases of Typhoid fever in the different camps varied with the methods of disposing of the excretions." They pointed out in their report that "flies swarm over infected faecal matter in the pits and then deposit it and feed upon the food prepared for the soldiers at the mess-tents. In some instances, where lime had recently been sprinkled over the contents of the pits flies with their feet whitened by lime were seen walking over the foods. Officers whose mess tents were protected by means of screens suffered proportionately less from Typhoid fever, than did those whose tents were not protected. Typhoid fever gradually disappeared with the approach of cold weather and the consequent disabling of the flies."

Diseases transmitted by flies:

Intestinal diseases like Cholera, Typhoid, Paratyphoid, Summer Diarrhoea, Dysentery (Bacillary and Amoebic) are fly-borne diseases; and in the Tropics, Ophthalmia (Sore Eyes) and various skin affections are disseminated in this way.

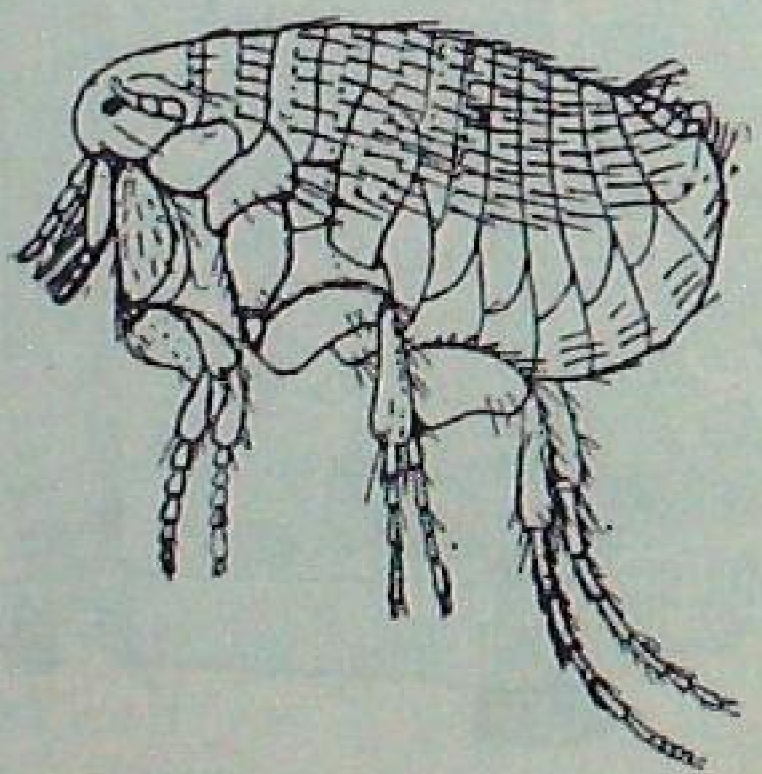
* "The repulsive regurgitations, dangerous droppings and filthy feet" of faecal feeding flies fouling food—(BALFOUR)

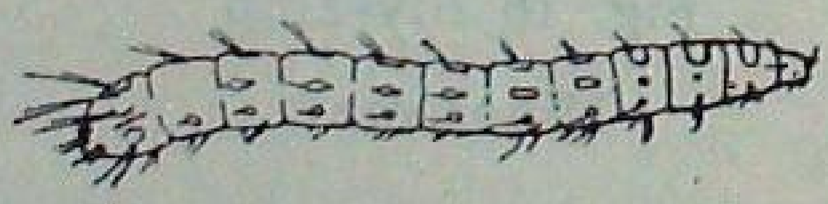
privies on the one hand and by screening kitchens and dining rooms, restaurants, food-stores etc., with fly proof gauze on the other. Failing this all food should be protected by covers or doolies.

D. THE FLEA

Fleas are minute parasites living externally among the hair and fur of mammals. They are wingless insects with a small inconspicuous head and a body which is hard and glistening and compressed flat laterally. Considering their very small size they can jump to considerable lengths and heights although they are wingless. This they are able to do by means of their powerful legs. The legs are provided with strong claws which enable the flea to get a firm hold on to the fur of its host. The lateral flattening of the body facilitates easy and rapid movements in between the hairs of the host.

(Fig. 17)
Xenopsylla Cheopis (Rat-flea)
Adult.





Larva of X. Cheopis (Rat-flea)
(Fig. 17(a)

Fleas are blood-suckers, their mouth-parts are adapted for piercing and sucking. Unlike the mosquitoes and other insects in which only the females are blood-suckers, fleas of both sexes live on blood. There are several common kinds of fleas, such as dog-fleas, cat-fleas, rat-fleas (Fig. 17), (Xenopsylla Cheopis) and the human fleas. But the most dangerous of all is the rat-flea, which has been known to transmit bubonic plague and is common on rats in many parts of India.

A writer in The Field sometime ago commented on the possible mortality of bees from the widespread use of such a powerful and persistent insecticide as D.D.T. There are, however, many other insects which as pollinators of flowering plants or as parasites and predators of noxious insects are of definite importance to crop production and whose destruction might have quite unforeseen consequences.

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flatus or wind in the bowels; or it is possible that the foetal movements may for some time pass entirely unnoticed by the patient until they become marked. Quickening generally occurs about the 18th week of pregnancy; the period at which it occurs is however, not a *fixed period.*

(3) *Morning Sickness.* Nausea and slight vomiting are common early signs of pregnancy occurring during the first four months of pregnancy on waking in the morning. As a rule it begins with the II month and continues to the end of the IV month. If morning sickness occurs in a married healthy woman it is a good proof of pregnancy.

These are the most important subjective symptoms occurring in almost all cases of pregnancy. Some women get salivation (water-brash) while others develop a capricious appetite for charcoal, lime, ashes, soap etc., as a result of pregnancy.

B. Objective Signs. (1) *The Face.*—Deposit of pigmentation occurs especially at the sides of the nose and under the eyes. Such pigmentation is not of much diagnostic value.

(2) *The Breasts.* The common relation that exists between the breasts and the organs of generation is so close that early indications of pregnancy are naturally seen in the former.

The various changes occurring in the breasts as a result of pregnancy are, as we mentioned above, their enlargement with increased firmness, which may be appreciated by the woman herself, or found out by the physician within the first two or three months of conception; from that time onwards the breasts become progressively larger and more knotty to the feel. Both these changes are very constant in pregnancy, but are not quite diagnostic of that condition as they may be present in tumours (new growths) of the uterus and the ovaries. But accompanying the enlargement of the breasts there is an enlargement of the superficial veins giving the breasts in fair women a somewhat marbled appearance. This condition, however, is present only in pregnancy and not in the case of ovarian or uterine tumours.

A characteristic change occurring in the areola con-

itself in the pregnant state; but eat sensibly keeping up her strength for the ensuing act of confinement and yet avoiding overloading the stomach and throwing too much strain on the liver and the kidneys.

The common impression that the pregnant woman has to "eat for two" is utterly fallacious and leads to over-eating. To overeat at the critical time is extremely unwise, for it brings on a kind of self-poisoning on account of the inability of certain organs of the body to work in the normal manner. Overeating also produces flatulence and colicky pains in the stomach, which are apt to be mistaken for labour-pains or threatened miscarriage and lead to unnecessary alarm to both the woman and the household.

Overeating even in a normal person is harmful, why then should a pregnant woman over-eat, when she has every reason to be careful about herself?

Now, a generous diet, we have seen, is one which includes not only proteins, carbohydrates and fats, but should contain a proper provision of mineral salts, especially of Ca, P, Fe and Iodine and of vitamins. Necessary as all these ingredients are in the diet of an ordinary adult, they are much more so in that of the pregnant mother, who has to provide not only for her own daily needs but also for the needs of the *rapidly* growing and developing foetus within her.

An increase in the proportion of proteins is advisable during pregnancy and period of lactation. The increase is required chiefly to provide for the needs of the growing foetus and for the growth of the muscular structure of the womb. Atleast one half of this amount should be 'suitable' proteins, as of milk, eggs, meat, these proteins having a high biological value as we have seen.

EXERCISE

Women of the labouring class who work in the open air throughout pregnancy are able to pass through their confinements with greater ease than those who lead sedentary lives; it is therefore reasonable to expect that women

ment is bad both for the pregnant mother and her coming child. Hence any style of living that affects the mental and physical health of the mother adversely should be avoided; for it is certain to leave its imprint on the child. The idea must be to "build up" not "pull down," and undue excitement and wrong modes of life are destructive.

THE HUSBAND'S DUTIES DURING THE PREGNANCY OF HIS WIFE

It is important that the husband should consider his wife and her health not only sexually but in other ways. He should refrain from exciting her by quarrelling or persistently finding fault with her, nor should he insist, as some husbands do, on her accompanying him to pleasure parties and merry making.

A National Baby-Week pamphlet says: "If there be a clinic school for expectant mothers it might almost be well there should be a school for expectant fathers" and suggests that the expectant father should take his wife a cup of drink in the morning *before she leaves her bed*, do all her domestic work, help his wife to look on the bright side of life and not carry his business-worries home more than is necessary. He must also look after the other children whenever he can.

We mentioned above that a calm and happy mind free from worry and all disturbing emotions is needed for the woman who wishes to bring a healthy and happy baby into the world. More than anything she should refrain from listening to stories told by the morbid minded and the mischief-making.

To sum up: The expectant mother should lead a life as tranquil as possible free from all unhealthy excitement, quarrels and other disturbances. It may, of course, be impossible to avoid all worries in this age, but they should try to worry as little as possible. Women whose husbands are men of only moderate means are apt to worry financially, they dread the additional expenses of a confinement and are apt to worry whether the money could be found without difficulty. All these worries, anxieties and fears—

dimensions of the non-pregnant state. *The lochia* (which means the discharge belonging to child-birth, the "cleansings" as it is commonly known) is the discharge which comes from the uterus during involution. In a normal case, where there is no infection, it consists from the first of blood, serum and mucus with perhaps shreds of the foetal membranes; later the blood gradually diminishes and finally about the 6th day the blood disappears, and the discharge then consists of a purely serous transudation.

The pulse of the parturient woman is as a rule slower than normal and the temperature may temporarily rise to about 100° on the first day after delivery as a rule in all cases.

The appetite for the first two or three days is usually somewhat diminished but increases later on as the demand made by lactation (secretion of milk by the breasts) increases. Thirst is usually keen at first in consequence of loss of blood during delivery and later as a result of lactation. The bowels are almost always constipated due in part to relaxed abdominal walls and in part to the recumbent position and lack of exercise. Digestive troubles like nausea and vomiting which might have caused considerable annoyance during pregnancy usually disappear with the expulsion of the foetus.

In consequence of the increased action of the skin and the kidneys and disappearance of the dropsy, the involution of the uterus and diminished ingestion of food there is a distinct loss in the weight of the woman during the first 8 or 10 days of delivery. The abdominal walls which were considerably stretched during pregnancy do become flaccid and wrinkled soon after delivery, but the condition passes off in about two months' time and a certain amount of laxity persists after the first pregnancy, and the striae gravidarum gradually become fainter.

The symptoms of a normal puerperium are generally slight especially in the labouring classes; infact as soon as labour is over the woman experiences a sense of relief which is in marked contrast with her former pain-harassed condition, and during the lying-in period she is in a state

the older child, which should contain a much larger proportion of cereals than the infant's diet. The amount of fibre or husk should be sufficient to give a ballast to the bowels but not great enough to produce diarrhoea from irritation. Consideration of these factors indicates that in choosing a cereal those prepared from whole grains are preferable; and since Wheat, Ragi and Oats are the most readily available in most localities these suggest themselves most.

Ragi. Latest researches have shown that Ragi contains a prolamin of high biological value. It is a staple food for a large population of India, especially the poorer and labouring classes and is the premier crop of the Mysore State and the neighbouring districts. It is perhaps the cheapest food grain in the market with a traditional reputation as a nutritious and sustaining food. Feeding experiments have shown that animals maintained exclusively on a diet of Ragi showed considerable increase in weight.

Each of the cereals, wheat, oats, ragi and maize is capable of forming by itself an adequate food for infants when combined with animal protein, as of milk or eggs. But in practice it is advised to combine two or more kinds of cereals in a diet, with the hope that the amino-acids of one cereal may supplement the amino-acids of another cereal.

A mixture of one part of Wheat and two parts of Ragi is commonly used among all classes of our people as an infant-diet after the 5th month. The cereals are cleaned and dried in the sun, powdered fine, mixed and tinned.

By Analysis one ounce of this powder-mixture contains:

3·30 grammes of protein.
22: 0 grammes of Carbohydrate.
0: 5 grammes of fat.

and minerals, Ca, Fe and P salts and Vitamin A, B_1 and B_2 in fair quantity. Now, it has been found by experience that the amount of Protein required for growth is roughly 4 grammes per kilogramme (or 2:2 lbs.) of the body-weight. As the average baby's weight is about 15 pounds

Cashew fruits contain a large amount of Vitamin C, 6 to 8 times as much as is contained in orange fruits, bulk for bulk.

Tender cocoanut-pulp contains good nourishment by way of proteins and fat; its mineral and vitamin content is rather poor.

Other fruits of antiscorbutic value and useful additions to children's dietary are pine apple, sapotas, peaches, pears and apples.

Only expressed juice of fruits is to be given to the baby before he cuts his teeth. If he can chew the best method of giving fruits is to give them raw (uncooked) and cut into small pieces. This gives the baby's teeth good amount of exercise and helps in developing the jaw-muscles also and is a great preventive of dental caries.

Vitamin D (Antirachitic or Rickets-preventing Vitamin.) In the addition of Vitamin D to the infant's diet, we may make a choice between Cod Liver Oil and the oil from the liver or body of several other fish; but Cod Liver Oil is mentioned first and is recommended as the method of choice for administering Vitamin D. The objections to Cod Liver Oil or other fish oils are principally their disagreeable odour and taste. If the baby is given Cod Liver Oil from a very early age and it is administered in a firm, calm manner it is usually taken well and tolerated. It seldom upsets the bowels and is less apt to cause vomiting also, once the baby belches. Cod Liver Oil has the additional advantage of supplying fairly large quantity of Vitamin A, which may be important as the milk diet is not particularly rich in this vitamin.

The dose used in infant-feeding is half a teaspoonful of the oil twice daily *before feeds* beginning in the 2nd week and increasing to 2 or 3 teaspoonfuls a day by the age of 3 months. The oil should be kept in a cool, dark place, as heat may cause it to become rancid and exposure to light destroy its antirachitic potency.

The oils derived from halibut-liver and salmon-liver contain Vitamin D and Vitamin A also. The dose of halibut-oil is usually 2 to 4 drops, which is equivalent to ½ to

Most of the symptoms of neuroses we meet with in nervous children are due to the ways in which they have been reared by their parents and the influences to which they have been subjected in their homes. Hence it is possible that these symptoms can be cured either by removing the children from the environment where the trouble occurred or by correcting the situation in the home.

The majority of children have some nervous difficulties or other when they grow up and much depends upon how they were trained by their parents or teachers in childhood.

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PREFACE

The old idea that disease was a malign influence of Nature or the result of some supernatural action has long been given up, and even from the days of Hippocrates, the Father of Medicine, it had been recognised that the factors which made for health and disease were many and complex, and mainly related to man's environment. Later with the development of Biology and Bacteriology the entire conception changed, when, it was discovered that man's environment, though it acted as a vehicle for the conveyance of disease or its spread from one individual to another, was not really responsible for it in the first instance, but that man himself was responsible, being the 'reservoir' of disease. It was thus recognised that, while a good and healthy environment was a *sine qua non* or an indispensable condition for good health it was not every thing and that man as an individual has to be considered in connection with his health. Further experience showed that too much attention was paid to ill-health and not enough to health, and hence directed that a general health-programme should aim not only at dealing with disease and its prevention, but at building in the individual a healthy body and a healthy mind from his earliest life, that is, from the time of conception and uterine life (prenatal life) to the time of death.

This led to the establishment of antenatal clinics—instructions in "mother craft," as it is called—which are now provided in all civilised countries by the State or Private Charities. Here, the expectant mother can obtain expert advice as to her own condition as well as of the unborn baby, and after confinement a work-woman is prevented from attending to her work for 4 or 6 weeks and receives during that period a maternity benefit also.

There is, further, the establishment of Child Welfare Centres and School Medical Services, also maintained by the State or Charities to ensure good health in the growing individual from infancy and childhood.

This is the key-note of modern health policy and methods of providing means of achieving health and preventing disease in a variety of ways which could not be

patients in all stages of infectivity. Why? Because they live as much in fresh air as the patients themselves. "In fact" says Dr. Muthu, "during the 30 years of my sanatorium life in England we never had one single case of typhoid, scarlet fever, diphtheria, cholera, plague, small-pox or any other infectious disease. Why? because the patients and the staff lived the open-air and hygienic life."

Again, how is it that the European part of our large towns is much healthier and free from disease than the native parts? Because the Europeans live in less congested parts, their streets are cleaner, houses well ventilated; in short, they live in much cleaner surroundings; hence they are able to prevent and resist disease inspite of the extremely enervating effect of the tropical heat to which they do not become easily acclimatised.

Regarding the value of sunlight the Ancients recognised that the Sun was the source of all energy and life, and utilised sunlight and heat to combat disease and keep up health. The Gayatri of the Hindus is only the invocation of Sun-god to remove from man all immoral and undesirable tendencies and mental perversities; and modern science has confirmed this view of the Ancients, viz., the power of sunlight in bringing to normal most of the important hormones or the internal secretions, as they are called, of our body which are so essential for a healthy long life.

It is a well known fact that epidemics of plague, cholera and malaria subside during the hottest part of the year, and show a recrudescence or break out again during the cooler months. Cholera is very common soon after the rains, when drinking water becomes contaminated by the rise in the subsoil water.

One important effect of sunlight is prolongation of life; naturally, when disease is prevented and general vitality or resisting power of the body against disease is increased, life should necessarily be prolonged.

A well-balanced diet. More important than fresh air and sanitation is nutrition to build up the body and keep away infection of disease. A well nourished body is the only sure protection against disease. While a well-balan-

population. During 1936 the number of births was nearly 280,000 higher than that of 1935; on the other hand, says the Report, the number of deaths was less by about 200,000, so that the estimated population for 1936 showed an increase of about 3,600,000, as compared with that of 1935 and stood at about 282 millions. Between the Census of 1931 and June 1936 the actual increase has been 6·1 p.c. Assuming the same rate of growth during the next 5 years the increase in the population during the decennium,—1931-1941—is, therefore, likely to be something over 11 p.c., or the total population be nearly 400 millions.

Now, the birth rate per mille or every 1,000 population based on married female population between 15 and 40 in British India is 212·5. This figure is almost double that of England and Wales, where it is only 112. The high fertility-rate in this Country has, therefore, a close bearing on the growth of the population inspite of the fact that mortality-results still remained at a high level. Incidentally, it must be said here, that increased fertility is as a rule characteristic of a half-starved or famine-stricken population and is often met with in Nature both in the case of lower animals and vegetable life. A tuberculous patient, male or female, is very productive, and a dying tree yields most. The object of Nature in these cases is to make the final attempt, an attempt at all costs, to "perpetuate the species." It may, therefore, be presumed that the high fertility rate among our people is in a great measure due to their subnormal nutrition and partly to poverty, child-marriage, improvident marriage etc.

Now, in attempting to assess the general health of the population and estimating the possible trend of events in this Country, consideration should be given to certain important factors, such as the low standard of living of the majority of the people, the large additions of 30 to 40 millions every decade to the population, the high mortality rate, the large amount of labour-inefficiency, disability and blindness brought about by epidemics and other preventable causes, and lastly the question of food production.

it is growing higher and higher, year by year in every other Country, in India it is growing shorter; e.g., in England it has risen from 49 to 51 and in America from 56 to 58, in New Zealand it has reached the highest and is very nearly 65; even in Japan it is as high as 47, whereas in India it has fallen from 25 to 23.

We have already mentioned that "protective" foods are unknown among the vast majority of the population. The poorer section of the population scarcely take any milk. It has been urged by Dr. N. C. Wright, D. Sc., that the total supply of milk in India must at least be doubled if the population is to have the "bare-minimum" (equivalent to about 10 ounces a day) necessary for health. Some Municipalities and certain private bodies have recognised the value of milk as food for growing children and have started supplying free milk to school children with very beneficial results, and it will be an ideal thing if an organised effort will be made to make this compulsory in every school and boarding house. It has been mentioned already that nutrition experts have lately recommended calcium-lactate as an effective and cheap substitute for milk, and Red palm oil, a cheap and equally effective stuff containing Vitamin A in place of the Cod liver oil with its cost and offensive smell.

It is common experience that nations with the largest population have the lowest standards of living. The vicious circle of poverty and large population can only be broken by increased production of food supply and increasing the wealth of the Country. It has been found that the most optimistic estimate of the average income, per head, per year in India is only Rs. 72, or Rs. 6 a month, that means a little more than 3 Annas per day. Whether it is possible for any one to manage from this paltry daily sum to get his food, his clothing, his children's education, to meet his house rent, medical aid etc., apart from his luxuries and pleasures "which make life meaningful" is a matter which can only be imagined and cannot be described. Hence the problem of population and health in India is really the problem of increasing the Country's productive-capacity and income, and a more positive policy of

difference in incidence—the summer diseases of the temperate climates being also diseases of the warmer regions and the winter diseases being mostly prevalent in colder climates. In general it may be said, then, that intestinal affections are more prevalent in warm weather and respiratory affections more prevalent in winter; and physiologists have explained the phenomena by assuming that in summer the blood is largely in the superficial parts of the body and the resistance of the intestinal walls is lowered by the consequent condition of anaemia; while in winter, physiologists say, the blood is in the internal organs, and the mucous membrane of the nose and the upper respiratory passages shows a similar lessened resistance as a result.

In some instances season and climate favour the spread of the transmitting agents also as in the case of insect-borne affections.

The effects of environments on disease-mortality are by no means purely seasonal in character. They are related to weather as well as to climate and season. We find, for example, that the death-rate from pneumonia is not only higher in the cold month January than in the warm month, June, but is also higher (on the average through a period of years) in cold Januaries than in warm Januaries. Nearly 300 persons are reported to have died of Pneumonia in the Punjab in the first week of January 1940, the abnormal rise in the death-rate being attributed to the severest winter experienced within the last 11 years.

Diarrhoeal diseases of infants do also respond very directly and sensitively to the daily and weekly variations in temperature during the summer months. In fact, a climate which exhibits moderate variations in temperature is more favourable for health than one which is even and unchangeable.

Huntingdon, who has contributed many stimulating ideas to the discussion of effects of climate says, that aside from biological inheritance the main factors in determining the health of a people are climate, food, parasitic diseases and the stage of culture; and that those areas of

surface water.

Tanks and Ponds. These are common sources of drinking water in villages and agricultural parts and are most easily fouled by people washing and bathing in them, by the passage of excrementitious matter of both human beings and animals directly into them, or by vegetable and manurial elements being washed into; sometimes cattle are bathed and surface drains are allowed to empty into them. Hence, proper precautions should be taken to protect such water supply from every sort of contamination.

Streams and rivers in their course through cultivated areas, towns and villages often take up impurities derived from sewage and industrial effluents particularly near the banks, and therefore such waters should be considered most unwholesome and unsafe for drinking purposes.

PURIFICATION OF WATER

The menace of water-borne diseases may be avoided by the adoption of certain methods of purification, and the first natural step is to seek out sources of initial purity and to protect them as far as possible from subsequent pollution. In fact, a public water supply should be such as will not require further purification by its consumers; and water derived from carefully protected springs and deep wells needs no purification, but in the case of surface water, river-water or water from any source liable to sewage or manurial contamination purification becomes necessary.

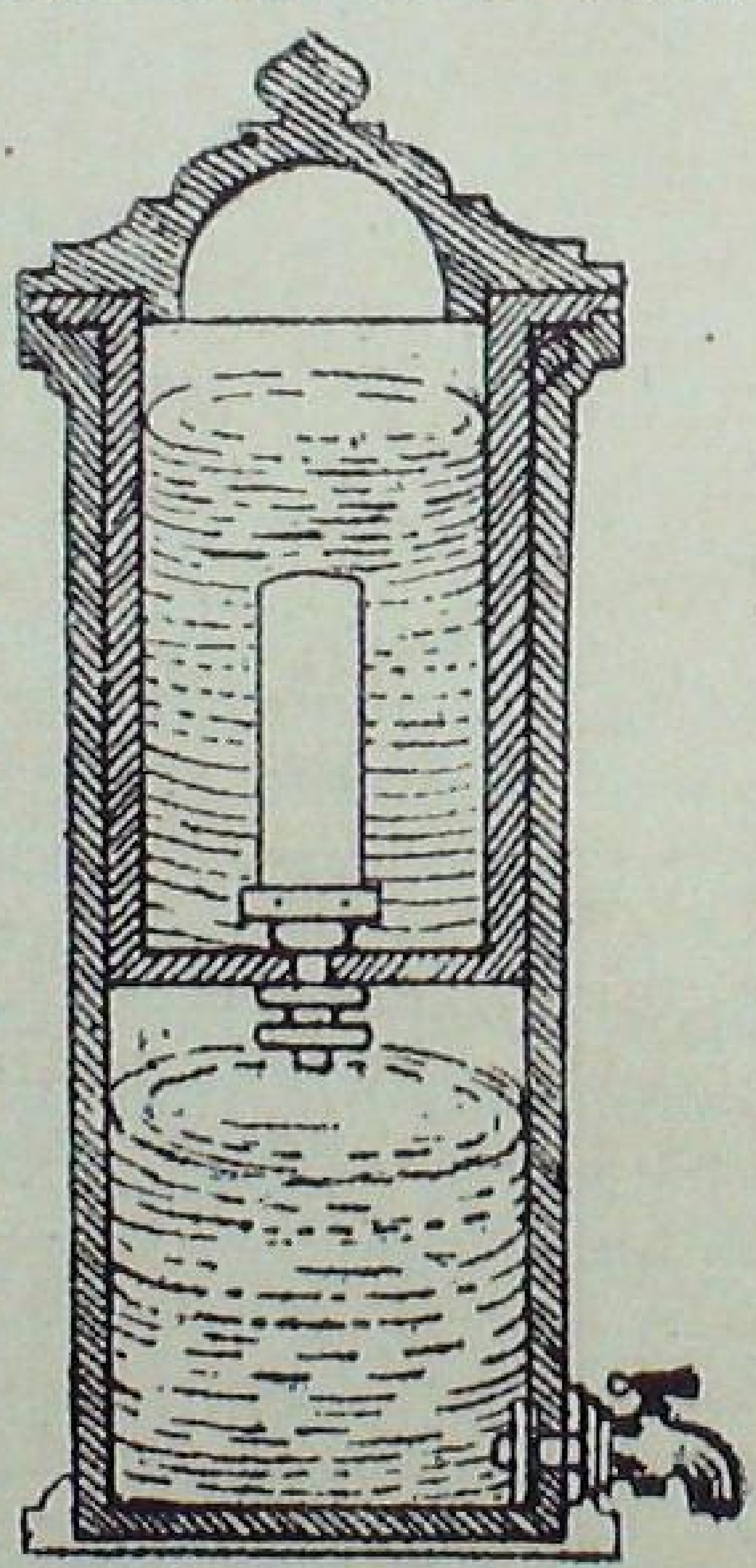
In Nature purification is carried on by *storage;* and storage is a real factor in the purification of public water supplies. We know that disease germs are parasites which can live only in the warm nutritious fluids and tissues of the animal body, and that outside the body in water or in earth or dust they die out readily in a few days. It is not, as we generally believe, the running water that purifies itself, but water that *stands* that purifies itself; and the death of disease-germs exposed to sun and other conditions that exist in lakes and reservoirs is astonishingly rapid. The factors, however, that bring about death of disease—

lant like alum, which as we have seen, forms a flocculent (wool-like) precipitate and serves as an additional filtering layer. As a result of the better filtering action thus secured the rate of filtration can be greatly increased, and as a result of this increase in the rate of filtration the filters can be made much smaller, but of course must be cleaned more frequently and must be washed throughout their depth instead of merely removing the surface layer as in the case of the Slow Sand Filters. The improved process is known as the Rapid Sand Filtration.

It would be out of place here, however, to give a detailed description of these two methods, for which the reader is referred to larger books on Public Health.

Domestic Filters. There are several varieties of these available in the market, the most convenient being the Pasteur-Chamberland and Berkefeld filters.

They are the only filters much used in houses and camps nowadays, because the Pasteur and in a lesser degree the Berkefeld (Fig. 1) really possess the property of efficiently rendering the filtered water free from bacteria of disease. The filtering material in these is a hollow candle composed of unglazed porcelin or silicious earth. They are not, however, without their disadvantages as the filter candles do soon become blocked up especially if the water is muddy, and filtration through them becomes inefficient. The candles should, therefore, be cleaned every week by brushing them with hot water and then sterilised by boiling in water containing some Sodium Carbonate. Muddy water should, therefore, be first strained through



(Fig. 1)
Berkefeld Filter.

Sunlight retards the growth of all bacteria and various protozoa and exerts a most favourable action on Tubercular patients.

Various vermin and insect-pests are readily destroyed by sunlight, and decomposing organic matter is changed into innocuous compounds.

Many research workers have found that direct sunlight produced changes in the rate of respiration, increase in the amount of CO_2 output and in the rate of growth in the immature organism. Others have apparently found that the intensive light conditions prevailing in most deserts stimulate the activity of the blood-forming organs to combat anaemia and increase the number of phagocytes. In India we have always an abundance of sunlight, but our perversity has ordained that this great life-principle should be debarred from many. The purdah-system prevailing in our Country keeps many women and children practically shut off from sunlight. Such people easily fall a prey to tuberculosis and chest complaints, and even adults are affected with rickets. The generally lowered vitality, the increased tendency to rickets and anaemia, lowered resistance-power to diseases like Tuberculosis among the "slum"—dwellers of our towns are accounted for by the fact that our streets are often too narrow to admit more than a sampling of sunlight and there is lack of open space for play and relaxation in the sunshine.

Let us, therefore, hope that the popularisation of the knowledge as to the effects of sunlight on health will bring about a reformation in our habits of building and town planning, living and clothing.

Lighting. Good lighting is as much essential in the home as it is in the school or work-house. It enhances the comfort of the occupants, encourages reading and study; increases the working efficiency, reduces the frequency of accidents, aids in safeguarding against certain forms of eye-strain and makes possible an increase in the length of the activity-day. And from all these points of view day light is preferable to any form of artificial lighting, which is very deceptive to colours also. Our eyes have through long ages gradually adapted themselves to the white light

after combustion is a mass of hard material called "clinkers" which may be utilised for road making and makes good cement on powdering and mixing with lime. Provided that the draught of air feeding the fire is properly managed even the simplest form of incinerator is perhaps the best.

Refuse from private houses, jails and hospitals are most easily got rid of by incineration and often the residue left behind is found to be good manure for cultivation.

2. DISPOSAL OF HUMAN EXCRETA

Human excreta should always be regarded as the most infectious material, as the germs of Typhoid fever, Cholera and Dysentery and ova of intestinal worms like the hook-worm and the round-worms pass out of the bowels of the infected individuals with their excreta; and if conditions and opportunities are favourable these germs or ova gain entrance into the alimentary canal of other healthy individuals and produce the specific diseases in them. Carelessness or ignorance of people has in the past perpetuated favourable conditions and opportunities for the passage of infected fæcal matter through the medium of drinking water or food, and epidemics of Cholera, Dysentery and Typhoid (known as bowel-complaints) used then to be more frequent. Later, when the causation of disease became better known and the mode of spread better understood all such epidemics were found to be preventable by the proper disposal of excreta and protection of water and food supplies from contamination thereby. Luckily the microbes of bowel-complaints or the ova of intestinal worms do not survive long even in sewage water especially if it is properly treated and precautions are taken to prevent sewage from gaining access to drinking water supplies.

The water-carriage system of disposal of excreta, which has been installed into most of our municipal towns has been helpful in banishing epidemics of bowel complaints from these towns, and this system is still held to be the best preventive against them. Unfortunately the system cannot be introduced into our villages, where,

workmen to lung troubles have been eliminated by the installation and use of suction-blowers. The modern employer finds that attention to these details and to light, ventilation and cleanliness save money in the long run. In many factories medical examination of all workers is compulsory and many incipient diseases are thus detected and corrected.

Child labour is gradually becoming the thing of the past in most countries, and hours of labour for adults are shorter and in some cases very short, so much so the general health of the labourers is much better than on former conditions.

In some trades workers handle materials which are poisonous or injurious to their health. Diseases produced under these conditions are known as Industrial Diseases. The most common of these are poisoning by phosphorus, arsenic, lead, brass and mercury. Government Inspection of factories engaged in the manufacture of articles in which such dangerous materials are used has considerably lessened the incidence of these diseases.

"Caisson disease" or "bends" which develops in labourers working in atmospheres of increased air-pressure is another example of occupational or industrial disease. The trouble is now entirely eliminated by very gradually reducing the air pressure surrounding the labourers while they are returning to normal atmospheric air pressure.

6. VILLAGE SANITATION

Modern notions of sanitation are quite unknown to our people especially of the rural parts, where a vast majority of them live, belonging as they do mostly to the agricultural classes. Their houses usually built of mud or bricks and roofed with palm thatching or country tiles stand in rows facing each other with narrow lanes in between. They are as a rule ill-ventilated there being few windows or none at all; and the rooms specially in the interior of the house where the women-folk and children sleep or work are generally dark and unventilated. The houses, moreover, are too close to one another and the

The evolution of the idea of cleanliness reached an important hygienic stage with the Hebrews. While its objective was religious we now find that the Hebrew ritual afforded equally essential protection from dangers of disease. It is said that the Book of Leviticus contains a remarkable collection of sanitary regulations. The minute directions regarding foods that were considered unclean have greater significance than their religious purpose. The purification of the woman after child birth may be easily interpreted as a sanitary measure, if consideration is given to what was required of an unclean person. The ritual with reference to leprosy presents the most striking example of a combined religious and hygienic application of the idea of cleanliness. It reads almost like the work of the modern Health Officer. It sets a standard of biological cleanliness, which sanitarians are still struggling to attain.

The prominent place accorded to bathing in certain religions has been responsible for the establishment of cleanliness as an important factor in life. While much of our bathing is done for other reasons than health, the results of a clean actively functioning skin are well recognised values.

The most significant step in the evolution of our modern idea of cleanliness arose out of the establishment of the true relationship of filth and dirt to disease. In earlier times dirt was considered not only the vehicle but the actual generator of disease. Dust was so frequently associated with pestilence that it was thought to be dangerous and so was dreaded. But we have already learnt that dirt is not dangerous because it is "of the earth earthy" but only because it may act as a vehicle for maintenance or distribution of living microbes of disease.

The psychological relationship of cleanliness is of significance. The association of cleanliness with beauty led to a new interest in bathing as an adjunct to feminine charm. At first it was considered somewhat beneath the male, but its general acceptance by both sexes has come with the realisation of the value of feeling of well-being resulting from bodily cleanliness.

determined largely by the proper relation of the two great factors—activity and rest; and exercise taken with due regard to the individual requirements of age, sex, occupation and capacity helps not only in maintaining health but is a valuable adjunct to recovery from disease.

A moderate amount of exercise is, therefore, necessary if the body is to be properly developed in youth and maintained in a healthy state all through one's life-time. Many of the ailments of people leading sedentary lives are mostly due to neglect of physical exercise, and no amount of care in dieting or drugging will sufficiently make up the deficiency.

Exercise is chiefly the use of muscles with a particular object in view and requires the co-ordinated action of the circulatory and the nervous systems. Now, muscle is a chemical engine for transforming energy latent in the body into mechanical action, and in order to function satisfactorily the muscles should be well nourished and should have "good tone" or firmness and resilience. The hardness of an athlete who has developed and trained his muscles is well known compared with the softness of a sedentary indoor worker.

Modern civilisation has, however, tended to increase mental stress, decrease the use of body muscles and made available a plentiful food supply; and this combination demands a careful adaptation of activity, of recreation and of rest in order that health be maintained at its highest levels. Sedentary life is highly unfavourable to vigorous health and this kind of life demands exercise that will compensate to the degree of inactivity. Sedentary life brings with it some real dangers to the vital organs and the earliest organ to suffer loss in strength is the Heart. Persons living sluggish lives have a low respiratory activity. The muscles themselves suffer indirectly from inactivity. Practically without exception such a person sooner or later pays the penalty by a degree of muscular flabbiness, which impairs his capacity for useful work and reduces the enjoyment of life. Nothing in the field of Hygiene has been more definitely established than the fact that muscular exercise is essential to health; and

and recreation, good hostel accommodation on up-to-date sanitary lines for healthful living, scout associations, holiday excursions and other activities for improving their general physique and tone, to foster in them the habit of feeling and thoughtfulness for others, and to promote the spirit of discipline, of self-reliance and of unity,—the combined effects of all these being a general broadening of their outlook.

But despite these facilities, the health of the student population generally to-day is anything but good; and the seriousness of the problem becomes obvious when we remember that the average student in our Country is much below par and enters life with the inferiority complex of a poor physique; and either because of poverty or ignorance on the part of the parents, he is underfed and undernourished and is easily susceptible to disease. Moreover, the alarming growth in recent years of eye-affections among the young is a matter which demands our serious attention; and when it is remembered that good eye-sight is a desideratum or an absolute necessity of modern life and for certain key-occupations, as of Air-Craft Pilots and Engineers and for entrance in the Railway and Marine service, and that even in European countries only one in a thousand is found physically fit for the air-force, the need to devote greater attention to the health of school-children from a very early age assumes special significance.

Although medical inspection has been existing in our schools for so many years now, it cannot be said to have appreciably contributed towards the improvement of the children's health. It cannot but be so. Because, when a school confines itself to medical inspection in most cases only once a year and leaves it to the parents to take action on the Medical Examiner's Report, the chances are that the children will not always and in right time get the treatment they need. It is, therefore, suggested—and it is certainly cheaper and more beneficial in the long run—to make available facilities for treatment as near the school as possible by organising a separate clinic for each school—what is known as the School Medical Service—where the prescribed treatment could be carried out with-

emotion are often disturbing factors in wooing sleep. The putting aside of the tension of the day is the first requisite for restful sleep, and it is a wise plan to taper off the emotional tempo by quiet relaxation of the body muscles helped by properly selected reading or music. A warm bath or warm drink at bed time is conducive to sleep.

Of course this extensive ritual is not ordinarily required for inducing sleep in the average normal individual, but is helpful in combating some forms of sleeplessness.

Experiments have proved that the normal person who sleeps on an average 8 hours in 24 hours is less efficient when he is deprived of even 2 hours sleep, and that after an all-night sitting it may be two or even three days before he is able to recover his normal efficiency and capacity for work. But, it has been found that one can manage with much less sleep than 8 hours if he sleeps better, and that the man who usually has that amount of sleep (8 hours) is not better off in the matter of efficiency than one who sleeps only 6 hours or even less but more "intensely." Bismarck, Napoleon and the great Akbar, all had only 4 hours' sleep in the 24 hours, but they must have slept intensely. In fact, Napoleon is said to have prided himself on his ability to go to sleep "at will" and wake up "at will" also. This remarkable capacity is a natural gift due, it is said, to their ability to "make the mind blank," whereby all extraneous disturbances to sleep, viz. light, noise were quite ignored.

In recent times we have instances of short sleepers in the great Edison, Poincare and Lloyd George, who have shown that it is possible to sleep little, yet be fit physically and mentally. The secret of these short sleepers is said to be their physical and mental energy and their arduous love of work, which makes every day seem to be too short.

In fact they compensated in depth or soundness of sleep for what they lacked in duration and thus the amount of sleep was ample.

SLEEPLESSNESS (Insomnia)

While sleeplessness, we saw, is so ruinous to health

Except in mild climates the infant should be well protected from heatloss by wool or silk and wool under garments. External clothing should be adapted to the external temperature changes. The clothing should not cause sensible perspiration under normal conditions.

As the child gets older the clothing should be reduced to a minimum compatible with comfort. While the sensation of "feeling cold" is not quite a safe guide in all cases it is a useful guide in the case of children. We are fortunately losing our passion for overdressing children. Clothing that gives a maximum of freedom of movement and optimum exposure to Sun's rays has proved to be hygienically sound and conducive to health.

Seasonal adaptation. The balancing of heat-production and heat-loss at various seasons of the year needs special attention. External temperature lower than the body temperature requires provision for adequate production of heat by the body and satisfactory heat retention. This should be accomplished largely by change of external clothing. When the external temperature is higher than that of the body the function of clothing becomes reduced to only protecting the skin against sun and dirt and satisfying the accepted standards of modesty and decency. All excessive clothing (not required by decency) should be abandoned.

Absorbent underwear and loosely woven outer garments in light colours make up the sensible hygienic outfit.

Materials of clothing and characters. The vegetable kingdom furnishes us with cotton, linen and wood fibre (artificial silk), while from animals we get wool, silk and furs. Generally speaking, those from the animal kingdom are warmer. All of these materials are classified according to their power for conducting heat away from the body and absorbing moisture.

Wool stands out for its qualities of warmth and absorptive abilities. No other material has these qualities to such a degree as wool. Linen ranks next, while cotton and wood fibre follow in order. Keeping the body dry by absorption of sweat with slow evaporation is a valuable

an immature girl of 13 or 14 can bring into the world a strong and healthy child. Child-marriage with poor food, repeated pregnancies, are the potent cause of still-birth and infantile mortality, and is one of the most important causes of degeneration of the race. No wonder there is no country in the world where still-births and infantile mortality are so high as India.

It has, however, been urged in favour of early marriage that the suppression of the sexual function must have a bad effect on health and that, therefore, marriage should take place in both sexes even at puberty. This argument seems to be based on a wrong assumption, as statistical evidence goes to show that the mortality among those married before the 20th year is very high in both sexes. In fact no girl can be said to be fully mature or developed before she is 18, and no man before he is 20. Even the great Manu, the Hindu Law-giver, states that the male should marry only when he has become a "grihastha", that is, at 24, and the female at puberty, that is, at about 14. No girl, therefore, who has the good of her country at heart and of her progeny and race should marry before she is 18 and no man before he is 20.

"*Improvident*" marriage is of importance both from economic and sanitary stand points. In countries where early improvident marriage is the rule not only are marriages numerous but the number of children born to each married couple is much larger than in countries where marriages are contracted only later in life, when provision has been made for the care of the children. The population in the former case tends to increase more rapidly than the means of subsistence, and it is naturally reduced by the "misery check" of famine and epidemics. This is the case in India; whereas in countries like Britain where provident marriage is the rule, the population increases more in proportion to the means of subsistence and is less liable to be "thinned" out by famine and disease. Where marriage is limited to parents of mature age also, even though fewer children may be born they are better cared for and fewer will die, so that the infantile death-rate is diminished.

The voluntary "prudential check" to increase in

The most cultured communities are foremost in spending large sums of money on alcohol and narcotics; and the habitual use of these can generally be traced to the anxiety, stress and worry inseparable under present conditions from civilised living. Material prosperity is largely illusive and life itself is often sacrificed in its attainment.

Now, mental deficiency is generally an inherited misfortune and is unfortunately on the increase in higher civilised countries, where an enormous number of feeble minded and neurotic individuals, men and women, are at large free to propagate their "Kind" in wedlock or otherwise. Most of these are without moral sense, lacking in conception of right and wrong, and are quite untrainable in moral behaviour. They have a tendency to commit serious as well as minor offences of a criminal nature. Among them there are obsessional train-wreckers, who place obstacles on Railway lines and stand by to watch the derailing of trains and destruction of life, enjoying the excitement of the disaster with a Sadistic zest (a love of cruelty); impulsive incendiaries, (who maliciously set fire to property) pyromaniacs (setting on fire any thing, even houses) and mischievous aments (deficient in mind) possessing a morbid desire for maiming animals or showing cruelty to them in one way or other.

While, then, our present outlook is so full of menace to the individual, the society and the race, our future outlook will be apalling so long as we continue "to breed as cavemen bred, automatically and instinctively" and without thought or regard for the future generation. We may take pride in the "applied science" that enables us to conquer the air, to converse with an acquaintance thousands of miles away, to beat the record of speed in locomotion and to manufacture gases of modern warfare or atom bombs, which can annihilate the enemies' camp in no time; we may also excel in scientific breeding of horses and cattle, dogs, rabbits and poultry, but the production of a superior human race we leave only to chance. The average citizen gives little or no thought to humaniculture, that is, production of men and women efficient for industry, social responsibility and healthy parentage. This of course is

these affections are especially remote in the alcoholic with his run-down constitution.

Dr. Nansen, while at a dinner of medical men and scientists was asked if he took any alcohol with him when he went on his Arctic Expedition, and his reply was, "No, if I had done so I should have never returned."

We have seen that small doses of alcohol do increase the flow of the gastric juice, but this increase is always followed by a decrease in the flow after the stimulation has worn off, and in course of time the gastric glands cease to work without the presence of alcohol. Again, we see that habit is established in this way too. Long addiction, therefore, gives rise to chronic dyspepsia from irritation of the delicate mucuous membrane of the stomach and the intestines and causes damage to the liver, the kidneys, the heart and the blood vessels.

The common idea that alcohol aids digestion is quite wrong; on the other hand, experiments have proved that the efficiency of the digestive juice is actively interfered with producing certain vague symptoms called Indigestion, Biliousness etc. Alcoholic dyspepsia is unlike any other form of the condition peculiar in itself, as it is the only cause of "morning sickness" in the male.

The action of alcohol on the muscle-cells of the heart is of a destructive nature, the muscle being converted into fat (fatty degeneration); this interferes seriously with the contracting power of the heart-musculature, and blood cannot consequently be forced along the blood vessels at the proper rate. Fatty degeneration of the heart, it must be mentioned, is the most dangerous of heart-affections, and the affected individual may drop down suddenly dead without in any manner showing previous signs of heart disease or even without the patient himself being aware of the condition. The blood vessels may also be affected by long use of alcohol; they become inelastic and rigid like "pipe-stem," their lumen gets thinner, blood pressure is apt to rise; and this combined with the fatty degeneration of the heart is especially dangerous, producing angina pectoris (agonising pain in the region of the heart) or cerebral apoplexy with paralysis, coma and death.

by inheritance to his descendants? This sounds common sense but it is not the real explanation. In the first place a son is apt to imitate his father, and the mere fact that a father drinks is likely to increase the chances of his son also doing so. Secondly, the first drunkard in any family may have inherited from his ancestors some hereditary *weakness* which made him especially ready to give way to this temptation among other forms of temptation, and he may have passed on this weakness to his descendants; a weakness which made them also in their turn especially liable to become drunkards. These are the real reasons why drunkenness sometimes runs in families.

The history of evolution of the alcoholic beverages and how the drink evil spread makes an interesting study. The savage tribes were all water-drinkers when they were first discovered and conquered by the civilised nations. Thus, the Australian tribes, even the Hottentots and North American Indians had evidently been ignorant of the art of preparing fermented drinks, because it is difficult to believe that an indulgence so tempting would ever be forgotten if it were once known. But in most countries where grains and fruits were cultivated the process of fermentation must sooner or later be discovered at first accidently by observing the changes in suitable juices and mixtures allowed to stand. Thus, in Mexico the milky juice of agave is fermented into their beer 'pulgue'. In Asiatic countries and Africa the date and other varieties of palms are tapped for making toddy or palm-wine. In Portugal and the Goanese territories in the west coast of India the juice of the ripe cashew fruits (anacardiam occidentale) is largely used for the preparation of arrack. Cider is prepared from applejuice and mead from honey; koumiss of the Tartars is mare's milk allowed to ferment. The aboriginal races of Assam made a beverage by fermenting rice known as "pachwai" and by fermenting palmjuice, tari or toddy.

The first mention made in history is of beer prepared from barley and rye by the ancient Egyptians, which evidently spread later to European countries and Russia. In Africa millet was in common use and early Chinese used

proving successful.

But whatever else may happen since the Country has gone dry, it is certain that,

"The sailor still will have his port,
The farmer his rye,
The cotton will have its gin,
The sea-coast its bar,
And each of us will have our bier,
(pronounced "beer")
No matter who and what we are."

TODDY

Toddy is obtained by tapping palm or date trees and is the chief form of industry in a number of provinces of India. The juice when fresh is absolutely non-intoxicating and forms a pleasant and nutritious drink. But when the juice is allowed to ferment,—which it does ordinarily within a few hours of exposure—then only it acquires mild alcoholic properties.

Now, it is quite easy to collect the toddy in an unfermented state; but what the usual practice is, the same pots are being used over and over again without cleaning between the collections; this facilitates fermentation. But if the pots are washed clean every time and smeared on the inside with slaked lime the juice obtained can be prevented from fermenting for some hours. Addition of a small quantity of solution of Sodium Benzoate or any acid like Boric acid or some other antiseptic preserves the palm-juice from fermentation. The palm-juice before fermentation is used for the manufacture of jaggery, a form of crude sugar cheaper but, as we shall see later, far richer in nutritive value than and superior as an article of diet to refined sugar.

Unfermented palmyra-juice has actually been a valuable agent in helping prohibition, as it provides a healthy pleasant drink in place of fermented toddy to those who are accustomed to the latter, thus enabling to satisfy their craving and gradually give up the drink-habit.

chunam. The calcium contained in the chunam and the clay pipe seems to increase the irritation and especially favours the onset of the disease. Thus, most of the cases of cancer of the mouth in South India are traceable to the habit of chewing tobacco with betel leaves and chunam.

Tobacco is, no doubt, an oral disinfectant and deodorant, and physicians and medical students often resort to smoking while attending a case of infectious disease like cholera or conducting an autopsy on a decomposed body.

The notion that smoking aids in mental work is erroneous. Tests in Universities and public schools have been made in this respect and have conclusively shown that non-smokers possess higher averages of intelligence and scholarship.

After many bad reports a good one can at last be given about tobacco. New investigations have demonstrated that nicotine has a beneficial influence on the suprarenals and encourages a large secretion of suprarenin or adrenaline. Thus, the glycogen in the liver and kidneys is converted into glucose and the sugar content of the blood is increased.

The same takes place after meals and this increased sugar content abolishes the sensations of fatigue and hunger. This explains the craving of tobacco when tiredness or hunger is experienced. And it is the experience of many that a light smoke in the company of friends especially after a heavy meal does away with most of its discomfort.

Although smoking by reason of its inherent fascination has achieved so much of popularity all the world-over, there is a good number of great men who never became enslaved to this evil. The greatest names in literature cannot be associated with "the fragrant weed," and Homer, Virgil, Dante, Chaucer and Shakespeare—all wrote their beautiful thoughts in beautiful words "unclouded by smoke." It is said of Sir Isac Newton that when he was urged to smoke he nobly replied "I would make no necessities for myself." Gladstone and Salisbury were non-smokers and possibly on this account they

smoking by diminishing the facilities for the practice of the habit by legislation. As a result of such measures opium-smoking has greatly declined; and although opium-eating is habitually done by large sections of the population the indulgence is not at the present time so widely prevalent as it was some years ago. The Government of India have strictly adhered to their promise to the League of Nations and have progressively reduced both the production and consumption of opium, so much so within a space of 20 years the total consumption of opium in British India (excluding the Indian States) has come down from 500,000 seers to 200,000 seers (one seer is approximately 2 lbs.). The average dose taken was roughly 10 grs. per addict (Chopra) as compared with 20 grs. worked out by the Opium Commission of 1895.

The problem of addiction to opiates in India, although still extensive, does not appear to exist in such intense and pernicious form as it does in the West with Morphia and other alkaloids of opium.

In olden days when opium was cheap addicts were undoubtedly found who took 180 to 500 grs. of the drug daily, but now on account of the rise in the price smaller dosage, not more than about 15 grs. daily, is now adopted. It must be said here that the British Pharmacopial adult dose of opium is 1 to 2 grs. and opium is not prescribed for children under one year of age, and after that age only particular B. P. preparations are given and in very small doses and only in the presence of disease.

Habitual administration of opium to infants at certain periods of their life has been prevalent in India for many centuries. The habit appears to have been started from the knowledge that opium allays pain, cough and diarrhoea and promotes sleep. In some of the Industrial Towns of India and in C. P. and Berar it is said that about 75 p.c. of infants of mothers working in factories are doped with opium, (balgoli or pills for children containing opium are employed in Bombay) to quiet them during their mothers' absence on work in the factories or cotton fields, and the practice starts during the first few weeks of Infant's life and is continued when the child attains the

Cocaine is not manufactured in India, but is largely smuggled by crews of ships running between Calcutta and the Far East and is heavily adulterated before being sold. Whereas in the West it is usually taken in the form of an injection or snuff, in India it is usually taken by the mouth with pan or betel leaf and is largely addicted to in the N. W. India, the Punjab, U. P. and Bengal and Bihar. The habit is not only confined to the well-to-do classes but a large number of artisan-classes also in large towns. It has been calculated by competent authorities that 200,000 ounces of cocaine were smuggled into British India in 1929 and that the consumers paid between Rs. 270 lakhs and Rs. 648 lakhs to the retailers for their doses of the drug (Chopra).

Cocaine is habitually used as a mild intoxicant, stimulant and aphrodisiac (stimulating the sexual appetite) either by itself or with betel leaves and nut. Applied to the mucous membrane or a raw surface or injected under the skin it is a local anaesthetic, deadening the sensory nerves. When swallowed cocaine produces stimulation of a pleasing or exhilerating nature followed by a state of mental depression. In poisonous doses death is due to paralysis of the heart and respiration and is preceded by convulsions. About 1 gr. of cocaine is sufficient to kill an adult unless he is gradually habituated to it, in which case much larger doses are borne as in the case of opium. In chronic cocaine-eaters the most characteristic symptom is the feeling of the presence of sand or worms or insects (cocaine-bugs) under the skin (Magnan's symptom).

14. MENTAL HYGIENE

This is the science and art of directing one's actions, thoughts and feelings in such a manner as to enable the person to attain the highest possible level of efficiency, health and happiness. Intelligent adaptation to one's environment is the basic principle on which mental hygiene is founded; that is, the individual must accept the environment in which he is placed with determination to adapt himself to conditions as he finds them. Mental health, thus implies both the free play of the individual's charac-

they usually rely unnecessarily on laxatives, and as a result of such reliance do not form habits which are conducive to normal action of the bowels. People should go to the closet at least twice daily, once in the morning on rising and again after breakfast or dinner and to remain there sufficiently long (10—15 minutes) unless an action of the bowels takes place before that time. They may, then, consider that they have done their part of duty and leave the rest to nature. People who have such an attitude seldom need a laxative.

Habits of thinking and habits of feeling are much more important from health point of view. People must learn to face realities whether they like them or not, and to consider each situation in terms of the principles involved rather than try to solve each situation, as if it were a distinct and separate problem, in no way related to the rest of their lives. Day-dreaming and phantasies are distinctly unhygienic and are apt to encourage hysterical reactions, as they are "a subversion of the proper use of constructive imagination." They are a type of self-indulgence which must be discouraged since they are conducive to mental ill-health.

Instincts. Instinctive responses do exist in all human beings; while all have the same instincts they do not have them developed to the same extent. Hence we are apt to think of people as being basically apprehensive, or sexual or pugnacious (fighting) or egotistical. Such instincts will not probably change materially in the course of a life-time whatever be the training or environments. *Fear* is the strongest of all instincts and is the most difficult of human emotions to handle wisely; it is without doubt the greatest instinctive factor in causing maladjustment (improper adaptation to one's environments) and consequent neuroses. People must understand that fear is a perfectly normal instinct, one of which they need in no way be ashamed, and which if employed as a stimulus to courage and adventure may be an important factor in their success and happiness. Basically apprehensive individuals must be taught that fear never injured any one, that it is a short lived emotion which will quickly pass

often a drawback to good mental hygiene by limiting opportunities; such a limitation is, however, often more apparent than real, inasmuch as there are many opportunities for recreation, diversion and education, of which people can avail themselves without expense and which are often neglected. Poverty also militates against mental health by virtue of the fact that people who are poor are kept so busy securing the essentials of life that they have little opportunity to cultivate intellectual and aesthetic interest.

It is necessary for people who have too little of the world's goods to understand that the material things of life are perhaps the least valuable of a man's possessions, and that poverty need in no way imperil a man's greatest wealth, namely his spirit, his courage.

Wealth and success are both often badly handled by the individual who possesses them. Wealth may lead to self-indulgence, love of ease, a disinclination towards hardship and a tendency to fixation on self; while success may cause exaggerated feelings of self-importance, disregard of others, poor adjustments to one's environment, undue belief in one's own powers and, if the individual has not further goals to work for, a loss of interest, a feeling of futility and frequently depression.

People who have secured these two material possessions, wealth and success, should understand that they are often a handicap to happiness and nervous stability, and that therefore there is all the more reason for them to carefully abide by the rules of good mental hygiene.

Work and Business. Occupation is an important part of every human being's life ; without occupation or work there is no happiness, little health and often nervous instability. The quicker a person can decide that he must work, that he is going to carry his full load of responsibility, and is going to do it gracefully and easily, the better is his chance for a comfortable, normal and successful adaptation. One should work with a purpose, preferably a desire to be of service to humanity and with the minimum consideration of the personal rewards which will accrue from such effort. People must

PART II

Dietetics

"In the past, Science has conferred on those people who have availed themselves of the newer knowledge of infectious diseases better health and a greater average length of life.

"In the future it promises to those races who will take advantage of the newer knowledge on nutrition a larger stature, greater vigour, increased longevity and a higher level of cultural development.

"To a measurable degree man is now master of his own destiny where once he was subject only to the grim hand of fate"

—Dr. James S. McLester of Alabama University.

interested in the technique of applying scientific knowledge to the nutritional needs of the normal individual, and the purpose of this chapter will be mainly to impart such knowledge even to the layman to help him in keeping "the doctor away."

A "Food" has been defined as anything which, when absorbed into the body *via* the alimentary tract (the food canal) is capable of enabling it (the body) to grow or to repair its waste, of furnishing it with material from which to produce heat, muscular work or other forms of energy and supplying certain substances known as "the regulators" of the body's functions of growth, repair and productions of energy.

This definition of food is for all practical purposes comprehensive enough and brings into prominence the three main functions of food:

(1) The provision of materials required for growth and repair of the fabric of the body;

(2) supplying materials which can be oxidised in the body with the result that the energy set free by oxidation may be used in performing work and producing body-heat;

also (3) supplying the body with certain substances (Hormones, Enzymes and Vitamins) which serve to control the various processes of the body.

Now, very few articles of food found in Nature are simple chemical substances, most of them being a mixture of several different types of chemical substances called "nutritive constituents," and even the most elaborate product of the culinary art resolves itself on *chemical analysis* into a mixture of these nutritive constituents. They are:

(1) Proteins—(a) Animal Proteins, such as albumen (of the white of egg), casein (of milk), caseinogen (of cheese), myosin (of muscle meat), gelatin (obtained from chondrin of cartilage and bone), fibrin (from coagulated blood) and globulin (from blood serum).

(b) Vegetable Proteins, such as gluten of wheat and cereals, and legumen from beans and pulses.

teins, salts and Vitamins) much richer and better article of food than rice.

Pulses, such as Bengal gram, black gram, green gram, dhall, horsegram, soyabeans are also rich in proteins, salts of Ca. P. and Fe, and most of the pulses are rich in Vitamin A, B_1 and B_2 also.

It is clear, therefore, that most of our staple articles of diet like cereals and pulses contain Proteins, salts and Vitamins though in varying proportions, but their proteins are mostly lacking in tissue-forming proteins. This deficiency has therefore to be made good by an adequate amount of milk, eggs or meat. Sugars and oils (cod liver oil, butter, red palm-oil, cocoanut oil, groundnut and gingelly oils) are wholly devoid of proteins. Roots and leafy vegetables and fruits are rather poor in proteins, but they are useful and necessary for the system and should form part of our daily menu for the better utilisation of the proteins contained in the diet.

Growing children and women in pregnancy and lactation (suckling mothers) should receive a larger proportion of proteins in their diet than ordinary adults, as proteins are most essential during the period of growth.

Proteins contain nitrogen and are therefore called "nitrogenous" food stuffs. In this respect they differ essentially from carbohydrates and fats, as the latter contain no nitrogen. Now, nitrogen enters largely into the composition of muscle tissue, and muscle therefore, depends for its growth and repair on nitrogenous food-stuffs like proteins; in fact proteins alone are capable of supplying both energy and materials for growth and repair, as we have already seen.

It will be shown later that one of the commonest errors in the dietary of the young and growing children in India, consisting as it does essentially of wheat or lesser cereals like rice, ragi, cambu and maize, is the deficiency in the diet of suitable proteins such as of milk and milk products or eggs or meat or fish or fowl and deficiency of green leafy vegetables and fruits (Protective elements,—Vitamins and salts).

use up a good deal of the glycogen reserve and may then have to fall back on their third line of defence and obtain energy by the breaking down of their body-fat. This method is not so satisfactory and may cause nausea and sickness if no carbohydrate is being taken. Persons fasting for several days and living mainly on their own body-fat may experience this nausea and sickness even though they may be resting and do not undertake any exertion.

The practical application of these facts is seen in rapid military manoeuvres such as the retreat of the Allied armies to Dunkirk in May 1940. During this retreat it was not possible to supply the troops with sufficient food to provide all the energy required for day-after-day marches and fighting, and to a considerable extent they were living on their own body-reserves. The amount of these reserves are of course limited and were only just sufficient to bring them to safety. The greatest bravery and heroism will not succeed unless our soldiers are provided with sufficient food to meet their energy requirements, and if we fail to do this it is foolishness to hope for victory.

Sugars after absorption from the alimentary tract are converted in the liver and the tissues into *"glycogen"* and to a lesser extent into *Dextrine;* glycogen can, therefore, be called animal carbohydrate or animal-starch, and liver is the only meat (animal flesh) that contains glycogen, but some kinds of fish and oysters also do contain glycogen.

[Dextrine is a gummy substance and is familiar to any one as the sticky material on the back of postage stamps; outside the body dextrine can be prepared by subjecting starch to a high *dry* temperature as in frying without oil or fat as we do in preparing potato-chips. Toast and crust of bread consist of starch converted into *a soluble form of starch* and *dextrine.*]

Now, the regulation of the glycogenic function of the liver and the tissues has an important bearing on the production of Diabetes, which is unfortunately one of the greatest scourges of our race; and constant use of large quantity of highly seasoned or sugary stuff in the

which is an indent for an extra quantity of water to be taken as drink.

Water is absorbed directly from the alimentary canal mostly by the small intestines without previous digestion, and with the water the soluble salts and sugars from food as we noted above. The need for inclusion of salts and water in the diet results from continuous loss of both these substances from the body by the urine, the sweat and through the expired air. Considerable quantities of salts and nitrogenous wastes are lost by urine and sweat, but no salts are seen to be lost through respiration.

Experiments on animals have confirmed these observations: "If an animal is fed on a diet free from salts the excretion of urine is practically free from salts; while if the water intake is also restricted the excretion of urine may be prevented altogether for several days."

It is difficult to estimate how long a person can survive if he were allowed to drink no water at all. Since the rate at which water is lost from the system varies directly with the amount of work and the outside temperature and humidity of the weather, under ordinary circumstances of comparative rest it would be a matter of several days. But it must be remembered that most of the common articles of diet do contain varying amounts of water and that some foods are capable of producing water during their oxidation, so that the period of survival might be said to depend upon the nature of the food also.

E. NEUTRAL SALTS.

The tissues of the body usually contain the elements Fe, Cu, Ca, Na, K, Mg, P, S, Cl, I, Fluorine and Silicon, and they are present in the form of their neutral salts. They are essential ingredients of nearly all the substances used as food. But a diet that does not contain vegetables and fruits can be said to be practically lacking in many of the salts, especially those of Ca, Fe, and P.

The important functions of the neutral salts are that they form the essential constituents of all tissues of the body. Thus, Fe and Ca. are the chief constituents of

in the gravy, which should not be thrown away but may be utilised as vegetable soup; this is the reason also why potatoes, for example are to be cooked in their skins. Steaming is thus the best method of cooking rice and cereals and fruits. To avoid loss of salts by cooking and also destruction of Vitamins, especially Vitamin C it is safer to use some part of the vegetables and all fruits without cooking but after thoroughly washing in clean cold water several times—"Unfired food."

COMMON SALT

The prominence given to salt in the phrase and fable of the East is difficult to be understood by the inhabitants of Temperate climates where salt ranks merely as one among the condiments, but in the East it is one of life's necessities—the salt of the Earth is second only to the water of life. Indeed the Gods in Egypt have been worshipped from ancient times as the givers of "bread and salt." With animals it is of even greater importance; big game can often be induced to forsake an ancient drinking-pool simply by moving a block of rock-salt, and no herd of cattle is without its "licking" stone.

In temperate climates this need for salt is not apparent, because there is ample in the meat diet of their inhabitants to balance the loss by excretion. In the tropics, however, its importance is reached when it is remembered that in the least oppressive circumstances a man may lose by sweating alone as much salt as he normally absorbs from his diet. The average volume of sweat alone in the hot weather in India is about 12 pints and this amount is found to contain about 300 grains of sodium chloride. Taking into consideration the amount of salt excreted in the urine, it may be safely said that the average daily requirements of salt in a Tropical climate are at least 500 grains, and if the amount of salt supplied in the diet falls short of these requirements there will be considerable deficit, which has to be drawn upon from the tissue-reserves. The result is ill health, languor and loss of efficiency both for bodily and mental work.

McEvan attributes this vague health and loss of

written Vitamin A, Vitamin B, Vitamin E, etc., and it is possible that in course of time as laboratory methods get more and more perfect more Vitamins may be discovered until one day we might reach the end of the alphabet.

1. *Vitamin A.* (Antixerotic, anti-infection Fat soluble A). This is found mainly in animal fats (except lard and baconfat), fish oils (like Cod Liver Oil, Hallibut Oil, Shark Oil etc.) butter, yolk of eggs, Liver of animals, birds and fish, Heart and Kidneys, whole milk and cheese (especially milk derived from grass-fed animals which is rich in Vitamin A and even richer than Cod Liver Oil), green vegetables like spinach, lettuce, cabbages, Brussels sprouts, greenpeas, amaranthus (keerai), agasthi keerai, moringa (murungai, Pterygosperma moringa, so-called from the winged seeds), string beans etc.; fruits like ripe tomatoes, bananas, dates contain a fair amount of Vitamin A; and tropical fruit papaya is exceptionally rich in Vitamin A; next come mangoes, apples, figs, oranges, lemons and grapefruit; pineapples contains small but appreciable amount of Vitamin A.

Vegetable oils are, as a rule, deficient in Vitamin A, except the red palm oil, which is a rich source of this Vitamin.

Milk, butter, cream and fruit juice containing as they do Vitamin A are the chief sources of it for children; so also all liver-fats like Cod Liver Oil. There is a variety of fish—Bekti—obtainable in Madras and the East Coast, which has been found to be far richer in Vitamin A than even Cod Liver Oil or Hallibut Oil. Cereals are in general rather poor in this Vitamin except yellow maize and greenpeas, which contain an appreciable amount.

In nature Vitamin A is usually associated with the yellow pigment (carotene) contained in yellow vegetables like carrots, pumpkins, squash, yellow sweet potatoes, apricots, peaches, oranges and tomatoes, all these are rich in Vitamin A; while white potatoes, onions, radish, beetroot contain little or none.

An adequate supply of this vitamin is essential for satisfactory growth in children and for increasing the power of resistance to infection; nursing mothers require

studied the question as to what influence diet exerts on pregnancy and early infant mortality in India, and they have come to the conclusion that the rather unsatisfactory condition of infants was primarily due to protein and Vitamin B deficiency in the diet of the pregnant mothers. Drs. Lakshmansami Mudaliar and Krishnan of Madras have shown that deficiency of Vitamin A and possibly of Vitamin D plays a great role in the production of puerperal infection and pre-disposes to the condition, as Vitamin A deficiency usually does in all cases of general infections. They are also of opinion that the treatment of the septic conditions after child-birth is greatly benefited by the free use of Cod Liver oil or preparations and substances rich in Vitamin A and Vitamin D.

(5) Observations from Uganda, China and Ceylon relate a kind of skin disease—Toad-skin (phrynodermia) in the Cingalese language—due to deficiency of Vitamin A (Mac Kay).

2. Vitamin B (complex) or Vitamin B_1 and B_2 is found in abundance in rice-polishings, branny coat of wheat and oats. Vitamin B_1—(Anti-neuritic or Anti-Beriberi factor or Aneurin or Thiamin). Vitamin B_1 is present in plant seeds, nuts and fruits, eggs and yeast, its richest store being the embryos of grains especially wheat and rice.

"Beemax" (maximum Vitamin B complex i.e., B_1 and B_2,—containing food) is only ground whole wheat retaining all the vitamins and salts of wheat. In grains Vitamin B_1 occurs solely in husks as the thin film or silver-skin just covering the grain, wherein also lies the embryo; so that if the husk is polished off as often occurs during the preparation of rice, the grain becomes useless as a source of this vitamin. Soya beans, oats, lentils and grams and millets contain a lot of this vitamin, and certain vegetables like cabbages, cauliflower, amaranth, lettuce, spinach, gourds, pink beans, turnip, lady's-fingers and almost all roots and tubers except colocasia; sweet potato and elephant yams contain a fair amount; groundnuts, almonds, walnuts and jack seeds do also contain a

1218 and probably existed long before and has occurred in armies and navies ever since. There is no record of the prevalence of the disease among the early mariners, evidently their voyages were too short; but when long voyages became more common, scurvy became more common among the shipmen as a result of long abstinence from fresh or green vegetables or fruits.

And although hidden reefs and icebergs were constant dangers, more deadly than these was this disease, scurvy, which always afflicted the men after a few days at sea.

Vasco de Gama in his trip of doubling the Cape of Good Hope about 1496 lost many men from survy.

The first important study of scurvy was the work of James Lind in 1757, and we read Capt. Cook was the first to observe in 1776 that the addition of fresh green food to the diet of the seamen prevented and cured scurvy, and Lind pointed out that scurvy was easily prevented and cured by citrus fruits; his work led to the adoption in 1795 of lemon juice as a compulsory item in the daily diet of the British Naval Vessels—a procedure which resulted in the disappearance of scurvy from the British Navy.

Scurvy is characterised by sponginess and bleeding of the gums, extreme lassitude, formation of haemorrhagic swellings in the thighs and about the eyes and tendency of bones to fracture readily. One important point to remember is that people suffering from scurvy are bad bleeders.

Scurvy is uncommon nowadays in civil life among adults, but common enough among children fed on tinned foods. We have seen several cases of scurvy in Tanjore, all of them in children brought to the Eye Hospital for "Black Eyes" mistaking the condition for some eye complaint; their history revealed that they were all orphans having lost their mothers early and had to be fed on artificial tinned foods.

The essential in the dietetic treatment of scurvy is to supply enough of antiscorbutic Vitamin C in the shape of *fresh* fruits and limejuice lemonade. Preserved vegeta-

Acid-forming foods are:

Eggs, meat, fish especially oysters, and poultry; bread (white and brown) cereals, pastries and puddings.

Base-forming foods are:

Milk, nuts, fruits (except prunes, plums and rhubarb) and vegetables especially beans and white potatoes.

male using about 2500 calories, (which, see later) and it is sound practice to secure most of these Carbohydrates from cereals, fruits and vegetables. Sugar by itself is irritating to the system and must be minimised in the diet. Jaggery prepared from date palm, palmyra, or cane-juice is a much better substitute for refined sugar containing as it does more nutriment and larger percentage of Ca and Fe salts and vitamins; jaggery is cheaper also; in the case of sugar, therefore, one has to pay much higher price to a really lesser quality of food article.

3. *Fat Requirements.* All fats, we have seen, are valuable as concentrated fuel, and animal fats especially are bearers of Vitamin A and D. They are used for their flavour and satiety-value. People in colder climates require more fats for obvious reasons.

For all practical purposes about 80—90 grammes ($2\frac{1}{2}$—3 oz.) of fats may be said to be the adequate daily requirements, provided the fat is in a digestible and assimilable form. Animal fats have already been shown to be superior in all respects including the presence of Vitamin A and some of them Vitamin D also, to vegetable fats and to be more easily and completely digestible. Vegetable fats are as a rule lacking in Vitamin A, (except the red palm oil already mentioned) and are more difficult of digestion; hence the use of butter and its substitute ghee, plenty of milk, green vegetables and eggs are recommended to supply the needed quantity of fats and incidentally vitamins also.

4. *Inorganic Salts.* We repeat here that Ca and P are present in large quantity in milk and milk products, eggs, beans, unhusked cereals and greens (amaranthus); that whole cereals, nuts and glandular meat of animals (like the liver and the kidneys) are direct sources of P. Iron occurs in green leafy vegetables, egg yolk, meat and whole grains in large quantity. Iodine should be obtainable from sea-salt in preference to rocksalt.

5. *Water Requirements.* Water, we have seen, forms the structural element of Protoplasm and a large percentage of our body; it forms a vehicle of transport and solvent and regulator of body temperature; and it has

B. M. R. is immensely increased depending upon the temperature, but while sweating profusely it is lowered correspondingly.

In diabetes the B. M. R. is increased as a rule, unless the patient is definitely undernourished, in which case it (B. M. R.) is much below par and can be increased by the administration of Insulin, the hormone of the pancreas, which has the power to increase the B.M.R. Thyroid extract increases heat production and is generally given to immature babies.

CALORIMETRY.

Since energy can be expressed in various terms and since the fuel value of food is determined by measuring the quantity of heat produced when a known weight of a foodstuff is burned (in a calorimeter) it has been customary to express all energy values connected with nutrition in term of "calories." A calorie is the unit of quantity of heat required to raise the temperature of 1 Kilogramme (2·2 lbs.) of water by 1° Centigrade.

Now, the B. M. R. represents only a portion of the total energy-transformations taking place in the body while practically at complete rest; and the most important element increasing the energy metabolism is muscular work. It has been estimated that about *100 calories per hour* are produced by a man sitting *still*; the same man *working* will produce 300 calories per hour; mental or nervous activity also increases metabolism but only to a very slight extent, as even the total weight of the entire nervous system forms less than 2 p.c. of the entire body weight.

The caloric values of food-elements like Proteins, Fats and Carbohydrates have been estimated; but they do not necessarily represent the amount of net-energy that is actually yielded in the body. Making an allowance of 2 to 5 p.c. for the loss during digestion etc., Rubner gives the following energy-values, and his figures are usually employed in calculating the "fuel" values of food ingredients. They are:

Carbohydrates 4 calories per gramme

the body. Such a diet, provides against *monotony* also.

Judging from another stand point—caloric stand point—we come practically to the same conclusion. We have seen that one ounce of mutton yields 42 calories; supposing a man living on mutton alone: to obtain 3000 calories daily he will have to consume about 7 to 8 lbs. of mutton daily, which is practically the same quantity as we obtained above.

Now, we have already seen that the presence of vitamins is necessary for the proper digestion and utilisation of all the four important constituents of food-stuffs, *viz.*, Proteins, Carbohydrates, Fats and Minerals. This further brings out in prominence the most important characteristic of a mixed diet, *viz.*, (1) that it ensures the presence of vitamins in one or other of the articles of diet, (2) that it is much more easily digested and assimilated than a diet consisting of only one single article of diet, (3) that it provides for variety and (4) that it is highly economical so far as cost and wastage are concerned.

D. BALANCED DIET.

Having so far studied the principles of dietetics from both qualitative and quantitative aspects of the essential elements of a perfect diet, we are now enabled to lay down the principles governing the constituents of an adequate diet or rectify the defects of that in common usage. These principles, whether in health or in disease are the same: calories, proteins, carbohydrates, fats, salts and vitamins are the essentials and should be presented in proper form. They should be derived preferably from both animal and vegetable sources; milk should form part of the ration for adults as well as for children and especially for nursing mothers. Fresh fruits and leafy vegetables have assumed a new importance; in the light of recent research they should form a fair part of one's diet to provide sufficient 'ballast' for the bowels. The effects of cooking and canning or otherwise preserving food, on vitamins make it advisable further to use some fruits and vegetables fresh and taken uncooked also in the dietary.

parts of the rice and not more than 4 or 5 oz. of dhal a day. The addition of this amount of dhal to the rice diet increases both the Vitamin B content of the food and the quality of Protein. So that by adding *atta* or *dhal* and *green vegetables* and *milk* to the rice diet we make good the defect of the rice so far as the quantity and quality of Proteins and so far as the quantity of Vitamin B are concerned.

The other defects of the rice are the same as those of wheat and must be put right in the same way.

* * * * *

III. Staple article of Diet—*Millet* (ragi, bajra). The defects of this grain are:

(a) it contains more protein than rice but less than wheat, and its proteins, while better than those of rice are not quite so good as those of wheat;

(b) it contains 2 to 3 times as much fat as rice, but not quite enough to make further addition of fat to the food unnecessary:

(c) as it is eaten after grinding into meal, it contains plenty of Vitamin B, but too little Vitamin A and no Vitamin C and D;

(d) it is, like all other cereals poor in certain mineral salts though more deficient in Ca Salts than wheat or whole rice;

(e) it lacks the necessary vegetable residue or ballast to help the action of the bowels.

So in order to make the Ragi diet 'complete', foods containing suitable proteins must be added to it, while its deficiency in fats, vitamins and mineral salts must be put right in the same way as that of wheat and rice.

* * * * *

IV. The defects of other staple food-grains—such as barley, cambu, cholam, etc.—are the same as those of cereals in general, and they can be corrected in the same way as those of wheat, rice or ragi.

BADLY BALANCED DIETS

McCarrison gives the following diets in use by:

(a) a poor Hindu Family,

(b) a well-to-do Hindu Family in Madras,

food value. This objection is only trivial and it is hoped that far more vegetables will be consumed by our people, rich and poor. Let no amount of success, however, in this respect lull us to an attitude of self-satisfaction in regard to the milk-position, because milk is an essential food for which there cannot be an efficient substitute, especially for those classes of our population to whom owing to religious prohibition meat, eggs and fish are a taboo.

Now, one of the tasks of those who are striving to improve diet in India, says Dr. Aykroyd, is "to educate the educated." And it is not the poor alone whose choice in the matter of food is extremely limited, that are ignorant and prejudiced about diet and suffer in health in consequence, but plenty of people in India and elsewhere who could afford to consume an excellent diet and to feed their children also on such a diet, do not in fact do so, because one can readily find among children of even the more prosperous classes cases of serious malnutrition and food-deficiency disease. Those who suffer from undernutrition or malnutrition usually cannot afford to purchase a satisfactory diet and many of the Children's Homes in this Country are very short of money and have often to feed their boarders on Rs. 3|- per head per month or a good deal less. Certainly it is difficult, in fact impossible, to supply a really satisfactory diet for such small sums.

But even when poverty prevents the purchase of a diet which satisfies modern standards of nutrition it is often possible to make effective improvements in diet with little increase in cost as above detailed.

FAULTY NUTRITION IN GENERAL

"The Commission is in agreement with the conclusions of the Barnet and Aykroyd Report that 'deficiencies' in important nutrients are a common feature of modern diets and that these deficiencies usually occur in the protective foods (foods rich in minerals and vitamins) rather than in the Energy-giving foods," states the latest Report of the Technical Commission of the Health Committee of the League of Nations published in December 1935.

It will be noticed from the Summary of their Report

tendency among the civilised races especially among the upper classes in society; a moderate excess of food is probably harmless and may not be much beneficial either; but this limit is apt to be frequently overstepped; more-over, the diet in the Tropics being mostly from vegetable sources contain plenty of carbohydrates and has to be usually taken in large quantity; and the common result of habitual feeding on such large quantity of food is *obesity*. The sedentary habits of the majority that can afford such diet tends to minimise metabolism and to deposit of fat.

Excess of Carbohydrate in dietary. An important dietetic error among the richer classes is excessive consumption of starchy and sugary stuffs. This large intake throws a good deal of strain on the digestive organs giving rise to gastro-intestinal troubles such as diarrhoea, flatulence and cardiac distress by the upward pressure exerted on the heart by the gas-distended stomach and intestines. Considerable strain is also thrown on the internal secretion of the pancreas, which is primarily concerned with the metabolism of carbohydrates; diabetes, therefore, results easily; and though excessive carbohydrates in the diet may not be the only cause of diabetes, the sedentary habits of most of such people go a long way towards the establishment of that disease.

Carbohydrates are not suitable for food in young children, as at that age they are incapable of digesting them from imperfect formation of ptyalin of the saliva and amylopsin of the pancreatic juice,—the two ferments concerned with conversion of starch into sugar. Infantile Biliary Cirrhosis thus results.

As a rule, bodily activities are very much reduced in the tropics, and the digestive powers are undoubtedly not so vigorous as in the cold or temperate climates. The European coming out to tropical countries cannot easily give up his original dietary habits of a temperate climate and continues to use a high protein diet consisting mostly of meats he was accustomed to, which is apt to leave a small fæcal residue; this combined with the lesser tonicity of intestinal musculature consequent on the tropical heat, tends to produce constipation and intestinal toxaemia, as

are able to digest and the first step in curing their stomach troubles must often be in the direction of compelling them to eat more.

It is an interesting question whether the effect of townlife in impairing digestive power may not be partly responsible for the habitual under-feeding so often found among town dwellers. It is possible, in other words, that the town dweller may in many cases be incapable of digesting enough food to keep him in an ideal state of physical efficiency.

Another of the remote dangers is in the influence of imperfect feeding upon the human mind. In addition to a lowering of mental power there is a feeling of dissatisfaction and depression culminating sometimes in melancholia and irritability, hallucinations and even madness evidently from imperfect nutrition of the brain.

A hungry man is an angry man and the proverbial good nature of the Englishman is perhaps associated with the fact that he is as a rule full fed.

To sum up: Besides the "deficiency" diseases like keratomalacia, beriberi, scurvy, rickets and osteomalacia caused by the deficiency in the diet of one vitamin or other and salts of Ca, P and Fe, there is the disease—pallagra—supposed to be brought about by the deficiency of proteins and probably Vitamin B_2 also. There is still a large circle of disorders arising from gastro-intestinal disturbances like dysentery, diarrhoea, sprue etc.—the result of dietaries poor in vitamins and proteins and rich in carbohydrates and fats. Decay of teeth is due to the common use of white bread or polished rice deficient in Ca and P salts. Cancer is often attributed to lack of Potassium salts in the blood and Tuberculosis to lack of Ca in the blood. Excessive use of starchy and sugary foods brings about diabetes especially with lack of exercise. Now, most civilised people are more or less unwell from the effects of chronic shortage of one or more vitamins or salts or proteins or all combined, which in the long run lead to poor physical development, lack of recuperative power and endurance, want of resistance to disease and infection and quickening of senile changes and old age.

injurious in some instances by depressing the general circulation.

It is said that the best employment after a heavy meal is "frivolous conversation" which keeps the heart active without making great demands on the brain.

One of the commonest hygienic errors of diet is to eat soon after severe exercise or work without a period of rest sufficient to secure recovery from acute fatigue.

Chronic fatigue is one of the banes of modern high-tension life and is common both among children and adult population. This type of people, therefore, need more rest, not more food.

The technic of eating has one important hygienic bearing. Proper mastication is the first step in normal digestion, and rapid eating is harmful and many a case of dyspepsia is kept up, if not actually produced by imperfections of the teeth.

A survey of the health habits of a large number of young adults reveals a high degree of correlation between late hours, insufficient exercise, irregular action of the bowels and "bolting of food" (just as one posts letters) on the one hand and poor nutritional status on the other.

Bolting of food is not only bad manners but is apt to cause many serious complaints including cancer of the stomach or the bowels, and probably appendicitis from solid particles lodging in the coecum. It is said of the great Napoleon that, though he was the conqueror of half the world, he could not conquer his hasty way of eating food, and that he died of cancer of the stomach.

Hunger. The sensation of hunger is one of the drives that assures the maintenance of bodily supplies of nutriment. Hunger is a general term and the sensation itself is referred to the stomach. Hunger is not a safe guide to nutrition even though the common folk largely believe this to be true.

Appetite is psychic as well as physical and expresses both the desire for food and a relish of the food when taken. It tends, psychically of course, to raise the level of nutrition by improving the tone of the digestive musculature and increasing the digestive juices. The appetite

pasteurisation destroys also disease germs from milk and renders it "Sterile."

Milk, as it comes from a healthy and perfectly clean Cow may be regarded as a sterile article of food, and it is even said that it has mild germicidal properties. Such ideal conditions are, however, difficult to attain in practice.

We said above that the density of the clot which milk forms in the stomach depends upon the thickness of the milk on the one hand and the acidity of the gastric juice on the other. It follows then, that by reducing the proportion of these two factors, the clotting of the milk can either be prevented or so altered as to render the clot much less dense. Obviously, therefore, simple dilution of the milk with water is sufficient to increase its digestibility, and dilution with either aerated water, soda water or lime-water by virtue of the alkali contained therein, will produce the same effect by neutralising part of the acidity of the gastric juice in the stomach. Barley water is also useful for this purpose, its action being probably due to the slight degree of viscocity which prevents the 'clot' from shrinking into a tough mass. For the same reason rice-gruel and oat-meal gruel are much better substitutes to barley water, being more nutritious also than barley water.

Boiled milk is said to be more easily digestible than unboiled milk by the human stomach, as some of the Ca salts contained in the milk are precipitated by boiling and the 'clot' is thereby rendered more flocculent.

The clot formed in the stomach can be rendered friable by the addition of citrate of sodium to milk, 10 to 15 grains to the pint; sodium citrate acts by converting some of the soluble limesalts into insoluble calcium citrate. Citrated milk is extensively employed in feeding infants and enables the employment of whole milk without dilution with water or gruel; the presence of the citrate, however, cannot be detected by the taste, and milk naturally contains so much of Ca salts that the removal of part of them from it by the addition of the Sodium citrate is no disadvantage whatsoever.

Thickening the milk with a little corn-flour or rice-

agricultural problem and in part a financial problem. It is agricultural in that it rests upon the farmer and dairyman to produce milk and to ensure, if it be possible economically, that the milk so produced shall be free from injurious or lethal contaminations. Experts have recognised that much may be done by improving agriculture to increase the quantity and to improve the quality of milk provided for human consumption; but the problem had not been adequately attacked in this Country until lately an impetus was given to it by Lord Linlithgow. The question of mass nutrition in India and how to improve their food supply in general and improve its quality was discussed at the Indian Science Congress held in January 1937 at Hyderabad, Deccan, under the presidency of Col. Olver, Animal Husbandry Expert. We have already discussed this question under Introduction.

Now, Veterinary experts are of opinion that more than 50 p.c. of cows producing milk for human consumption, are tuberculous and that the largest percentage of Tuberculosis in children, especially scrofula, joint affections and glandular enlargements, owe their origin to infected milk. "To say these truths in the language of the laboratory" as Moynihan puts it, "milk containing living active Tubercle Bacilli taken from the diseased cows is placed in a medium most favourable for their culture, namely, the medium of the young, active and succulent tissues of the growing children, and in many cases the children in an incubator (known in the Municipal language as the 'Slums') in order that every facility and all necessary pabala or food for propagation may be lavishly supplied."

To ensure that pure milk should be given by the cow and protected from contamination both during transit and delivery is a problem of complexity and of difficulty, which seems to increase with one's growing knowledge of it. The primary truth is clear, *viz.*, that tuberculosis of bovine character in man is consequent upon Tuberculous disease of cows and upon nothing else. The only solution that naturally occurs to any one is that the affected animals should be slaughtered and only healthy ones allowed to

management of animals and gaining also the benefit of a healthy occupation.

Goats are liable to infection, however, by certain parasites and also to infection of Undulant Fever (Mediterranean Fever) which has been proved to be transmitted through *cow's milk* also. The goat cannot, therefore be considered the sole carrier of this disease.

Measures should, therefore, be adopted to improve the breeds of goats also by selection of the best types to breed from and prolong their period of lactation and improve the quantity and quality of milk yielded by them. While goats can easily and economically be kept in country parts, it is surprising why this source of milk supply is not much resorted to by our people.

BUFFALO'S MILK

Buffalo's milk is much thicker than cow's milk or goat's milk and therefore has a higher sp. gr., and the casein and fats are in much larger amount also. Undiluted it forms a thicker clot in the stomach.

"The fat and casein of cow's milk are more easily digestible than those of buffalo's milk; cow's milk has greater amount of vitamins than buffalo's milk; these qualities affect children and adults equally, but an adult can digest buffalo's milk, while a child cannot"—these are the observations of Prof. Sahasrabhode of Poona.

Buffalo's milk is richer in fat than cow's milk and is largely used in the preparation of butter and ghee.

* * * * *

Percentage Composition of Milk of Common Animals

	Water	Fat	Protein	Lactose	Inorganic Salts
Cow's milk	85·5	5·8	3·5	4·5	0·70
Goat's milk	86·88	4·07	3·76	4·64	0·85
Buffalo'smilk	82·35	7·51	5·05	4·44	·75

SOUR MILK (Curds, Butter-Milk)

Souring of milk is due to the action of lactic acid fer-

is mostly fat and the caloric value of fat, we have seen, is $2\frac{1}{4}$ times that of carbohydrates. But in practice it has been found, although one is unable to give any definite scientific explanation, that fats cannot wholly be replaced by sugars or carbohydrates without detriment to health, as refined sugars are, as has been explained already, great irritants to the system and should never be given especially to children, to the diabetic and to the dyspeptic; the element of vitamins is totally absent from them and much more so from jam.

Even regarding the cost, $3\frac{1}{2}$ parts of jam cost nearly three times the cost in Madras of one part of butter.

We may, therefore, conclude considered from whatever view-point jams can never be adequate substitutes for butter.

CHEESE

This consists essentially of casein and fat of milk and is prepared by allowing whole milk (cow's) to clot by means of rennet; it is then squeezed and the whey is poured out. If the pressure is high, "hard" cheese is obtained, while a low degree of pressure produces a "soft" cheese. The cheese is next set aside for 'ripening,' which is a kind of fermentation brought about by bacteria resulting in certain chemical changes in the casein with the formation of peptones, part of the casein being converted into fat also. Cheese, therefore, consists of casein, fat and water (in the proportion of 1 to 1 to 1) and a small amount of lactose and salts dissolved in the water. Cheese is not easily digested by the stomach on account of a large amount of fat, for this forms a water-proof coating preventing the access of the digestive juices to the casein. Cheese has, therefore, to be masticated well before swallowing. For this reason hard cheese can be said to be more easily digested than soft cheese, as soft cheese like other soft things does tend to elude the teeth. Once the cheese is digested in the stomach, its absorption in the intestines is easy and complete, nearly 90 p.c. being absorbed. Cheese is therefore, a highly nutritive food having a high caloric value also, and its food value is more than double that of meat.

unsound fish is limp, the tail droops, the eyes are dull and sunken and the gills are pale and dirty-looking; the flesh pits on pressure and is easily separated from the bones, whilst the smell is usually appreciable.

Fish may be infected with cysticerci of certain tapeworms and may give the disease to the consumers if the fish is not properly cooked.

OYSTERS

Oysters are the commonest form of molluscs used as food. It is said to contain *within itself* all the three nutritive constituents of food—namely, proteins, carbohydrates and fats. It is said that Oysters on cooking become tough and more difficult of digestion than uncooked; the carbohydrate contained in oysters is Glycogen, which is the only form of animal sugar known and is contained also in the liver of animals. Oysters are, therefore, unsuited for the use of the diabetic.

Oysters grown in estuaries in which sewage water is allowed to flow might easily become infected with typhoid germs derived from the sewage, and have been known to convey the disease to the consumer. This risk, however, can be avoided by cooking but at the cost of diminished digestibility.

VARIETY OF FISH AVAILABLE IN THE MALABAR COAST

The following edible varieties of fish are available in the West Coast of the Madras Presidency, and fish-curing forms the chief industry.

Sardines (S: Longiceps; *Mal: Matti; Kon: Pedva; Tulu: Bhootai*) and Mackerals (*Mal: Aila; Tulu and Kon: Bangudai*) are abundant and are the chief sources of fish oils used in medicine in place of Cod liver oil and in the manufacture of insecticidal soaps. The Vitamin A contained in Sardine oil is appreciably high in amount. Mackerals however are not a good source of oil.

Fish-cake left after extraction of oil is very rich in manurial elements and is extensively applied to the soil in Coffee and Tea plantations. Fish-meal contains a lot of Ca and other salts containing Nitrogen, Phosphorus and

most abundant in wheatbran, bajra, rice, cholam, ragi and oatmeal.

Most of the cereals contain vitamins. Vitamin A is present in bajra, wheat, cholam, ragi and yellow maize, while rice is the poorest in the matter of Vitamin A.

Vitamin B_1 occurs in oats, wheat, millets, bajra and par-boiled rice.

Vitamin B_2 is contained to a certain extent only in whole wheat. As a rule whole grains are rich in Vitamin B_1, while milled grains lose nearly all of them; the only exception is parboiled milled rice in which Vitamin B_1 is retained after milling.

Vitamin C is present in large quantity in tender maize and sprouted grains, and Vitamin D is *absent* altogether in cereals; Vitamin E is present in yellow maize and rice. Refined wheat flour (American or white flour) is nearly all Carbohydrate and contain a small amount of Proteins, but in the matter of minerals it is extremely deficient and is entirely devoid of vitamins.

The proportion of water contained in cereals is about 10—12 p.c. even in the dry grains, that is, the same percentage as of proteins.

All cereals are rather deficient in building material except oats, and none of the cereals can be regarded as an important source of fat. As a group they are extremely *well absorbed*, in which respect they rank next to animal foods or in some cases even above them. This fact combined with their compactness and richness in nutrients places them in the front rank of man's foods.

It must be noted that cereal plants or "grass" makes an excellent fodder for cattle, containing in their green state a lot of Vitamin A, B and C in addition to carbonaceous and nitrogenous matter.

To recapitulate: 1. Cereals provide large percentage of the total energy of the diet at comparatively little cost and have therefore, become the foundation of dietary all over the world. 2. Their proteins are however, not quite suitable ones, i.e., they are deficient in amino-acids; these amino-acid deficiencies have to be made up by the suitable proteins of milk, meat or eggs or by the use of a variety

sidency by only 3 or 4 millions. Millets, therefore, form a very important section of the food-crops in India, and the grains the food of the poorer classes. Unlike rice millets are not dependent on an abundant water supply but thrive in areas of poor rainfall also as in the provinces of Bombay, Madras and Hyderabad.

Now, millets have greater food value than is generally supposed; and while wheat is the best and rice the worst of all common cereals, millets like cambu, cholam and ragi occupy an intermediate position. They contain as much protein as wheat, 12 to 15 times as much fat as rice and double that contained in wheat, and are well supplied with mineral salts and vitamins. Ragi, a favourite food of the poor is a very nutritious cereal being almost comparable to wheat and is rich in Vitamin B. We have already seen how the ill-balanced rice diet of the people who do not take enough of vegetables, fats or pulses can be improved by replacing part of the rice diet by millets. Yet it is very strange that there is a growing tendency even among the ryot-population to prefer rice to millets, and even school-children and others who are expected to know better prefer white polished rice to millets.

One important advantage of millets over rice is that good malt and malted foods comparing quite favourably with those of foreign make (prepared from barley) but costing only quarter as much, can be prepared from cholam and ragi. These foods have been put to practical tests in hospitals and the reports are encouraging enough for one to hope that there is a good scope for them as a cottage industry.

It is not perhaps fully realised that millets produce much more bulky and nutritious fodder than rice crop, and in a province like ours with uncertain rainfall, or in places without irrigation facilities as in the West Coast, and high mortality in cattle from famine and pestilence, the importance of building up large reserves of fodder from millets should not be lost sight of. Mention has already been made of the ill-balanced nature of the rice diet and the means of improving it by part replacement with millets. Luckily it is usual for the millets grower

contained in wheat-germ oil); the endosperm is characterised by an abundance of starch, and the bran by a preponderance of mineral matter and cellulose.

It must be mentioned here that both the Proteins and Carbohydrates contained in the wheat grain are *chiefly present in a soluble form.*

In rejecting the germ and the bran, the miller undoubtedly discards some of the most useful chemical constituents of the wheat, such as proteins, fats and vitamins contained in the germ, and mineral matter, proteins and vitamins from the bran. Hence refined white wheat flour (maida) is mostly Carbohydrates and is devoid of portion of Proteins and fats and nearly all minerals and vitamins of the whole-meal flour *Atta.*

BREAD

In making Bread the wheaten flour is kneaded into a "dough" with water, which is left-exposed to air. Yeast cells normally present in the air find their way into it and start to grow rapidly and multiply (the dough being a nutrient medium for their growth) and produce fermentation resulting in CO_2 and alcohol; other minute bacteria get into the dough at the same time, and these produce sourness (acetic acid, lactic acid etc.) so that the dough not only ferments but becomes sour. It was this fermenting dough that was originally used for making bread and was known as "leaven"; a little of this leaven was added to the first dough and the yeast which it contained started to grow through this fresh dough till the entire mass was leavened and filled with bubbles of CO_2. This leavened dough was then baked, part of it being kept over to be used for the fermentation of the dough of the next batch of bread.

Now, the making of bread is possible only with wheat and no other cereals as wheat only contains "gluten," a protein which has the peculiar property of becoming viscid and gummy when mixed with water, and when CO_2 is formed in the dough as a result of fermentation the bubbles cause the dough to become cellular when baked; the cells no longer collapsing the bread is rendered spongy.

RED GRAM *(Cajanus Indicus) Togari*

Is commonly made into Dhal and forms a useful supplement to Rice Diet. It contains a fair proportion of proteins, a good percentage of Iron and Vitamin A, B_1 and B_2. A black variety is commonly grown in Malabar and is a highly flavoured pulse especially while tender.

SOYA BEANS *(Glycine hispida)*

Soya beans resemble in appearance dried peas, but when soaked in water they elongate and look like lentils. It is the richest of all the pulses in Proteins (43 p.c.), has also a large amount of fat (20 p.c.), but very little starch (21 p.c.), a large amount of mineral salts especially Fe (11.5 p.c.), P and Ca. Regarding the vitamin contents it surpasses all pulses and cereals, Vitamin A, B_1 and B_2 being abundantly present even in the dry grain.

By reason of low starch content soya beans are of use as a substitute for bread in Diabetes; a flour being prepared from it and made into loaves or biscuits. As pure soya flour has a bitterish taste, which may be an objection perhaps in the case of some people, it is mixed with an equal quantity of wheat flour before being used as food.

In China and Japan it is extensively eaten in the form of soya cheese and as various sauces and pastes; all of which are rich in proteins and fats and are best fitted to supplement the deficiencies of their rice diet.

It is also grown in India and does not require much of care and promises to be a cheap but very nutritious article of food for the poor and rich alike.

A synthetic product, soya milk or *solac*, has been prepared and closely resembles cow's milk and is able to replace cow's milk to a large extent for many purposes.

The fried-beans powdered are exactly like coffee in colour, taste and flavour and is an efficient substitute for coffee but much more nutritious and non-stimulating.

PEANUT *(Groundnut, Arachis hypogea)*

Although botanically one of the pulses, peanut really resembles more closely the true nuts. Like the nuts it is

Potatoes like all tubers may have their composition and consequently their nutritive value considerably modified by the mode in which they are cooked. If they are peeled and soaked before being boiled a large part of their nutrients (Proteins and mineral matter) will be lost, and it is for this reason that potatoes should either be steamed or cooked in their skins.

The digestibility of potatoes depends largely upon the form in which they are *eaten*, being less digestible when eaten as lumps; "mealy" potatoes are more easily digestible than "waxy" potatoes.

The absorption of boiled potatoes in the intestines, however, is almost *to the last grain* as they contain much starch and little cellulose, yet they are *not suited to constitute the staple diet* of man, they are much too bulky and contain too little protein in proportion to their starch; and if one should live on potatoes alone about 6 lbs. of them may be required by him for his daily requirements of energy.

This quantity is unduly bulky, weighing as it does about 3 times as much as an ordinary mixed diet. The result of the continued use of such diet will be undue burdening of the stomach and bowels, producing dyspepsia, dilation of the stomach and diarrhoea. The so-called "potato-belly" of the Irish peasant is an example of such a result.

As an article of diet potato is recommended to replace part of the sugars and highly milled cereals in a diet.

SWEET POTATO *(Ipomoea batatas)*

Is a product of the tropics and is a common food of the poor. In the matter of nutrition it equals potato but richer in the matter of starch and Vitamin C. It was discovered with Potato by the Spaniards in Brazil and introduced into Spain in 1519. The natives of Brazil called it "batatas" corrupted into "potato". The Potatoes mentioned by Shakespeare in the 'Merry Wives of Windsor' are really the sweet potatoes.

YAM, ELEPHANT YAM. *(Amorphophallus campanulatus)*

Is more or less allied to potato in its chemical com-

The rhizome or root stem of some forms grows to an enormous size and are used as food, of course baked; they are, however, digested with difficulty and are apt to produce colicky pains and windiness from presence of a lot of fibre.

TAPIOCA *(Manihot utilissima)*

(Maravalli kananga). This plant belongs to the N. O. Euphorbiaciae (the same class as the castor plant). It is extensively grown in the waste lands in Malabar and Travancore and forms the staple diet of the poor, as we saw.

The roots contain about 40 p.c. starch with trace of protein and minerals and are entirely devoid of vitamins. Several varieties are known, but one of them, the most nutritious and most productive, economic and with little fibre is the "butter stick" variety, introduced from Poona; each plant bears at its root 4 to 8 long club shaped tubers varying in size from 12 to 18 inches in length. These when cooked become soft and mealy being fibreless and it is for this reason that it is named "butter stick". As an experimental measure this variety was once grown in the Mental Hospital, Calicut and yielded a good supply.

The cultivation of the plant is not difficult, the only consideration being a loamy and light soil; it can be cultivated on dry land at the beginning of the monsoon and does not require much of watering later and can be reaped in less than six months.

Commercial tapioca is derived from the roots of South American Cassava plants; curiously enough one of these —the bitter cassava—contains mixed up with the starch a milky juice in which is present a good deal of that dangerous poison, Prussic or Hydrocyanic acid. The roots are grated and washed with water, the bitter principle is thus washed away, and the starch allowed to settle. It is then collected and dried. The percentage of starch present in commercial tapioca is about 87½.

Tapioca is difficult of digestion and cannot be borne by a weak stomach even as a porridge; but its absorption

those of Fe but is deficient in vitamins except Vitamin B.

Fenugreek (Trigonella foenum Graceum) Vendai-keerai, methi bhaji—contains a small amount of protein and Carbohydrate but a fair amount of Iron salts and a lot of Vitamin A. It has a bitterish taste and has the medicinal value of being good carminative and laxative acting by stimulating the liver.

"Gogu" (Hibiscus sabdariffa, or cannabinus) Rozelle hemp—Jelly plant—Indian sorrel—*Pulichen keerai, Ambati bhaji*, Sourcress—is an edible variety of hemp.

The tender leaves are used extensively in the Circars in the form of chatni with salt and chillies and fried pulses. Contains oxalic acid and a fair proportion of Fe but no vitamins. It has nice laxative properties.

The ripe red pods of this hemp yield a juice, which when heated sets into a jelly and are therefore used to make jams.

"Agathikeerai" (Sesbania grandiflora)—Bak—Commonly used by Hindus to break the fast; contains a fair proportion of Fe and vitamins.

Spinach (Spinacea oleracea)—Basalakeerai—contains a small amount of albuminous matter in the form of mucin, fair amount of Fe and a large quantity of Vitamin A, B_1 and C.

Spinach is therefore a good laxative and demulcent, is capable of minimising tissue-waste and has considerable antixerotic, antiberiberi and antiscorbutic properties, especially when raw tendrils are eaten. Spinach is, therefore, superior in all respects to fresh potato juice and can be administered to children mixed with honey and sugar.

Luni (Potulaca oleracea) is a form of fine leaved cress known as Karicheera.

Chakvat Bhaji (Chenopodium album) Pappukoora in Telugu, is a common form of edible cress, having like amaranth great antiscorbutic, demulcent and laxative properties useful in piles and gonorrhoea. They are also rich in mineral salts, as of Potash and Iron and contain albuminous matter and other compounds of Nitrogen. They are all good sources of Vitamin C when used raw.

Drumsticks (Moringa pterygosperma) contains a fair amount of Protein and Carbohydrate, trace of fat, a fair amount of Fe and Ca salts and Vitamin A and C. It is said to stimulate the liver.

Plantains (green). Most of the varieties used as food contain starch as much as 14 to 18 p.c., a little protein and fat. They are all deficient in neutral salts, but contain a fair amount of Vitamin A, B_1, B_2 and C. Plantain meal or flour prepared from one variety of plantain (known in South Kanara as *Boodhi balekai* is extensively used as Infant's food and food for invalids and dyspeptics, especially those suffering from too much of acidity in the stomach. The well grown green fruits are baked by steam, peeled and made into a paste in a mortar, then dried and powdered. It is preserved by the addition of omum (carum copticum). A Teaspoonful of the meal boiled in water, and mixed with milk forms a fattening food. (*See Banana meal*).

The unripe fruits sliced and fried in ghee or oil is a common preserve, having good keeping qualities.

Plaintain flowers and stalks are also used as greens; they contain a lot of fibre except while tender. Plantain flowers are credited with curing diabetes, and the fresh juice of some varieties of plantain stalk grown in Ceylon is reputed to be a cure for snakebite, a cupful of the juice being given freely by the mouth; while other varieties are said to help the solution of gravel in the urine.

Jack (Arto carpus integrifolia). The tender jack is used as a vegetable, but is fibrous and indigestible. The seeds of the fruits are very nutritious containing 6·6 p.c. proteins, 38·45 p.c. Carbohydrates, trace of Ca, Fe, Phosphates and Sulphur, and are largely used as food by the poorer classes in villages. Biswas finds on analysis that the ripe seeds are not a negligible source of Vitamin B_1 particularly in consideration of their large consumption and that the Vitamin B_2 content is almost twice as much as their Vitamin B_1 content.

The variety of Jack—*neerugujje*—not bigger in size than the bread-fruit but with its leaves resembling those

The unpeeled nuts are fried, the brittle shell broken and the nut-kernel separated. The average composition of the Cashew nut (the edible kernel) is as follows:

Protein	22 p.c.
Fat	46 p.c.
Carbohydrates	23 p.c.
Fe	5 p.c.
Ca, P	Trace.

Vit. A and B_2—Fair quantity.

The nut has a high Caloric Value and an Acid Value of 5·21%. The Cashew fruit is also rich in nutriment. Dr. K. M. Shenai of Mangalore, who recently tested the vitamin content of the Cashew fruit, has found out that it is abundant in Vitamin C. His results, which were corroborated by Dr. Aykroyd of Coonoor, state that in every 100 c.c. of the juice of Cashew fruit there are present about 376 Mgms. of Vitamin C. Equated into Oranges, one Cashew fruit, Dr. Shenai opines, gives as much Vitamin C as eight Oranges of the best quality. In money value the Vitamin C that a dozen Cashew fruits supply the consumer can be estimated at Rs. 4. (See under Cashew fruits).

No edible oil can be extracted from the nuts by expression but the shells do yield in the process of frying a thick, tarry, empyreumatic oil, which is commercially used for the preservation of wood from dry rot and giving the mud flooring of houses a hard water proof glaze. The oil has a high antiseptic value also and is used in chronic skin diseases such as ringworm, chronic eczema etc., as an external application properly diluted, as in the pure state it is highly irritant and visiccant.

Cashew fruits contain a lot of sugar from which cashew arrack is prepared especially in the Goanese territories, where the Excise Rules are not much enforced.

Cocoanut (Cocos nucifera) appears to have been introduced into South India from the Southern Islands perhaps Ceylon as its vernacular name, Tengai, (Tẹnkai) suggests; and the class of labourers that pluck the fruits from the trees are called Dweepavars (Islanders) corrupted into Deevars, Thevars, Thiyars etc., by which that

nates. A few fruits such as cherries, grapes and figs contain no sucrose, whilst in a few others such as apricots and peaches sucrose makes up the greater part of the sugar present.

[The remainder of the Carbohydrates contained in fruits is made up of indigestible material like cellulose, pectin etc., which are of no material value as nutriment, but in the process of ripening some of them seem to be converted into a form of sugar—pentose—which has no nutritive value either.

It is the pectin contained in some fruits that produces a jelly when subjected to boiling with water. The amount of cellulose varies greatly in different fruits. It is always lessened by the process of cultivation and it diminishes also by a sort of natural digestion during the ripening of the fruit.]

The grapesugar or glucose of sweet fruits has the power of keeping up the heat of the body similar to that possessed by starch of bread, cereals and vegetables; but fruits are superior to bread or cereals, because the glucose in the fruit is ready for assimilation as soon as eaten, whereas the starch of bread and vegetables should undergo protracted and difficult digestion in the mouth and the intestines in order to be converted into glucose—*the starting point of the fruit-food.*

Another advantage and of equal importance is that fruits contain specific "organic" acids—tartaric, citric and malic—which have an aperient action on the bowels by stimulating their activity and that of the liver and thus purify the blood and the system.

The mineral constituents of fruits are of considerable importance. They consist mainly of Potash united with the various acids referred to above. They have an agreeable acid flavour and are converted in the body tissues into Carbonates and serve to render the blood more alkaline and the urine less acid. Thus one ounce of lemon juice contains about 50 grs. of Citric acid and is able to neutralise 50 grs. of Sodium Bicarbonate.

As the fruit ripens these vegetable acids diminish to some extent, and it is to this fact, coupled with an increase

Egyptian variety; but the palms grow wild even in dry sandy soil in India and are tapped for their sweet juice, from which both jaggery and toddy can be prepared.

Figs (Ficus carica) is another valuable member of the group of food fruits. In the undried state figs contain a large percentage of water as much as 80 p.c.; protein 1·31 p.c. and Carbohydrates 17·0 p.c.; they also contain a trace of Iron and Vitamin C.

Dried figs on the other hand contain only 15 p.c. of water and are therefore more concentrated in respect of proteins (4 to 5 p.c.) and Carbohydrates (65 to 70 p.c.) and have a high caloric value; weight for weight figs are more nourishing than bread; and a pint of milk and 6 oz. of dried figs make a very good meal.

One pound and a half of figs yield about 400 grammes of Carbohydrate or 4|5 of the total requisite amount of the nutritive ingredients required daily.

Raisins (or sultanas) *(Vitis vinifera)* are dried grapes and contain about 78 p.c. grape sugar, 2·0 p.c. proteins, 4·0 p.c. Iron and trace of Vitamin B_1. They are as nutritious as Dates or Figs.

Prunes (Prunus domesticus) and Raisins have all similar composition and are equal to Dates and Figs in their nutrition. Raisins contain traces of Vitamin B_1 and Vitamin C.

Apples (Pyras malas) contain:

Carbohydrates	15 p.c.
Proteins	Trace
Iron	Trace
Vit. A, B_1 & C	Small quantity.

They contain little fibre and are absorbed more or less completely. Apples are rich in malic acid and even young children should be encouraged to eat them freely.

Bullock's Heart—Ramphal (Anona reticulata)—contains about 21 p.c. Carbohydrate and are difficult of digestion. They are devoid of any vitamins.

Custard apple (Sitaphal—Anona squamosa) has similar composition and properties.

Guava (Psidium catelianum or P. guyava). The pulp is full of Fructose and pectin and when boiled sets

(2) Malt sugar (maltose) derived from malt.

(3) Milk sugar (lactose) from milk.

(4) Glucose (also called Dextrose or grapesugar) occurs abundantly in grapes. Commercial *glucose* is obtained by boiling starch with acids and occurs in thick syrupy mass.

(5) Fruit sugar (Levulose) is found in most fruits.

(6) Invert sugar (a mixture of glucose and levulose). It can be prepared from canesugar by the action of ferments or by simply boiling it with acids. Honey is the commonest type of Invert sugar obtained in Nature and contains equal parts of dextrose and levulose, the flavour of honey being due to the presence of small amounts of volatile oils derived from flowers.

Composition of Honey—Average sample of Indian

Honey contains:	Sucrose	1 per cent.
	Glucose	35 per cent.
	Levulose	39 per cent.
	Enzyme-Diastase	10 per cent.
	*Phosphatic acid	—a certain amount.

**For the first time the presence of this was detected in honey by Dr. K. V. Giri of the Indian Institute of Science, Bangalore.*

MALT

Malt is obtained by moistening barley and allowing it to germinate in heaps at a moderate and regular temperature. During the germination important changes take place. The ferment, diastase, appears in the grain and acts upon some of the starch converting it into dextrin and malt sugar, while, part of the (insoluble) proteins by the action of another ferment is also converted into soluble forms of proteins. The "green malt" so produced is next dried and when the drying is complete the malt is ground and made into a mash with water; when allowed to ferment longer malted liqours are produced, such as Beer etc.

Malt Extracts are prepared by evaporating down an infusion of malted barley at low temperatures or in vacuo,

chronic constipation, drinking of one or two tumblerfuls of hot water, the first thing in the morning either plain or with the addition of a few grains of bicarbonate of soda or potash, or at least a pinch of common salt; the alkali or the salt in the water tends to dissolve the glairy mucus often present in the stomach in such conditions, neutralise the acid produced by fermentation of undigested food, and wash out any overnight remnant of food in the duodenum. In the duodenum it sets up peristaltic movements of the bowels resulting in their free action.

The stimulating effects of hot water on the stomach movements render it a powerful aid to sluggish digestion. Water actually hastens the digestion of some foods by softening them and favouring their reduction to a state of pulp, and this action is increased if the water is hot.

The "unlocking" of the pylorus brought about by hot water explains the immediate relief felt on taking hot water in gastric colic from indigestion.

In cases of pyloric obstruction either from ulceration or cancer, where the contents of the stomach are unable to pass through the pyloric valve the absorption of water into the tissues is prevented causing much emaciation and discomfort to the patient; this deficiency may go so far as to prevent the proper excretion of waste products also and give rise to headache, convulsions, coma etc., from their accumulation in the system. In such cases there is an urgent need to introduce water into the system by some route other than by the stomach, preferably by the rectum, from where the water is readily absorbed into the system.

The rapidity with which water passes through the stomach causes it to be a very dangerous means of carrying infection; for the hydrochloric acid of the gastric juice in the stomach is not given enough time to destroy any disease germs that may be contained in the water. For this reason contaminated water is a more obnoxious cause of disease, such as Typhoid fever, cholera, dysentery etc., than contaminated milk. Hence it is that water more than milk should be above suspicion; but both should be properly boiled before use.

The eliminative function of water is of the foremost

above suspicion, as, if the water should be contaminated with disease germs there is no guarantee that they will be entirely killed by the cold, although their vitality may be thereby lowered and growth checked. It is for this reason, we said, that if one should prefer cold in his drinks it is much safer to place the drinks in cold or iced water rather than to add ice directly to the drink.

Fruit syrups—prepared actually from natural fruits, not by the addition of synthetic flavours—are very good drinks in the hot weather, supplying Vitamin C also which overcomes langour of the hot weather.

TEA, COFFEE AND COCOA

Tea and coffee are very popular beverages in every country. They contain an active principle—theine or caffeine, for both are identical—and certain volatile oils which give these beverages their characteristic flavour.

The chief difference between a cup of tea and a cup of coffee is that tea contains a certain proportion of tannin (as much as one grain in a cup of tea infusion), while coffee contains none.

The varieties of tea are named according to the different leaves of the tea plant from which they are produced; and the proportion of the theine and tannin contained varies in different teas. The theine is so soluble that it is practically all dissolved out of the leaf immediately the infusion is begun; but the proportion of tannin infused varies with the length of time the leaf is allowed to infuse. There is thus less tannin after 3 minutes' infusion than after 5 minutes', and less after 5 minutes' infusion than after 10 minutes'; but beyond 10 minutes' one does not find much increase, for by that time practically all the soluble ingredients have been extracted from the leaf.

From this the practical lesson learnt is that if one wishes to avoid having too much tannin in his tea he should infuse it for as short a time as possible, not more than 2 or 3 minutes in the case of good tea; and if a good tea is infused for not longer than 5 minutes all the theine and tannin extracted will be in the form of theine-tannate,

rally habituated to their use on account of their mild stimulant effect.

The question to what extent these beverages can be indulged in without injury to health cannot be easily answered with a definite reply. The part played by personal idiosyncrasy and habit is very variable. With many coffee and tea produce wakefulness. Yet there are persons who cannot go to sleep without a cup of tea or coffee at bed time; some may not be affected with even large quantity of tea, but may become ill with a cup of coffee, and *vice versa*. Such facts cannot be easily explained, and make it impossible to lay down any definite rules regarding the dietetic use of these beverages. But the accumulated effects of tea-drinking or coffee-drinking may be said to be generally for evil on the human system; an unnatural stimulation is produced and is readily followed by an equally unnatural reaction as is the case with all stimulants; and persons of nervous temperament are most likely to suffer from the drink as its effect is to produce in them a general "nervousness;" the person so affected starts, for instance, at the slightest noise or disturbance, and tea-tasters usually describe this condition as "jumpiness." Dyspepsia and palpitation of the heart are very common in them; the dyspepsia results from the astringent effect of the tannin of tea producing contraction of the blood vessels of the stomach and "tanning" as it were of the mucous membrane of the stomach; the palpitation, however, is the result of both irritability of heart caused by the theine and the upward pressure on the heart exerted by the stomach distended with flatulence of dyspepsia.

It is certainly a much less easier task to give up the coffee or tea habit than alcohol or tobacco, and the best way to do so is to squarely cut off the drink altogether with a resolute mind; to give up by degrees will be like keeping the devil still at the door and will never succeed. An efficient and safe substitute for these beverages may be found in a cup of hot milk, which combines in it both nutrition and stimulation of a harmless nature.

COOKING

The nerves of taste and of smell are designed to enable

The simplest mode of preparation of bread known to mankind seems to have come in with the earliest cultivation of grains and cereals and is still being continued without much change. The meal is moistened with water and kneaded into a dough, which is then spread out thin and baked over a hot iron pan or girdle or in hot embers. Such unleavened bread being first in use the invention of leavened bread followed as a matter of course, as the souring or fermentation of the dough made it more spongy and light ("leaven"—lightening). Later on when brewing of ale was discovered yeast from the brewing tub was found to be a better means of leavening the bread.

The other great means of preparing starchy food was by boiling with water, which broke the cellulose covering setting free starch grains to be dissolved in the water. Rice and other food grains were thus used as food after cooking in water to form a porridge.

[In connection with the evolution of the mode of cooking meat it may be of interest to the reader to know how boiled pork came to be the food of mankind. Writes Charles Lamb, the author of Tales from Shakespeare, in his humorous dessertation on Roast Pig: "Mankind," says a Chinese manuscript, "for the former 70,000 ages ate their meat raw, clawing or biting it from the living animal just as they do in Abyssinia to this day." According to this manuscript, he says, Ho-ti, a swineherd had kept his swine in a thatched hut and had gone out to his fields for work. Before his return the hut caught fire due to carelessness of his idiotic son, Bo-bo. Bo-bo fearing that his swine might have been burnt to death touched them with his fingers to see if they were alive. As they were still hot and scalding Bo-bo unconsciously sucked his fingers. Thus it was, it is said, that the taste and flavour of boiled pig was first recognised by mankind. It is said that after this event the method of boiling pork consisted for a long time of setting fire to the hut itself where the swine were kept confined.]

Modern civilised form of cookery is, however, advanced so much that there are at present countless number of dishes and sauces, all contrived to please the palate

such as vomiting, diarrhoea, staggering gait, palpitation of the heart etc.

Now, it has been found by experience that signs and symptoms of disease tend to occur in definite groups; in other words, different individuals suffer from similar combination of abnormal, rather perverted vital activities. These groups of symptoms come to form distinct ideas in the minds of observers and each group forms a *disease*, which has a distinctive name given to it. Thus, the sudden onset in a previously healthy individual of pain in the side, high fever with shivering, rapid breathing and perhaps a little cough—all these form a group of phenomena sufficiently characteristic and recurring with sufficient frequency to attract attention, and in course of time this group of symptoms was recognised as a *disease* distinct from other groups of symptoms and received the name of Pneumonia. Further observations showed that in people who died of Pneumonia some portion of one or both the lungs was altered in structure and appeared solid instead of spongy, and this underlying physical condition came to form the idea associated with the presence of the disease, pneumonia.

As knowledge advanced further certain precedent conditions came to be recognised as being "*causes*" associated with this particular disease. Thus, it was noted that exposure to cold often preceded an attack of pneumonia; while, in recent years it has been discovered that many diseases are the effects produced on the body by the invasion into the body of certain minute vegetable or animal organisms, that these organisms grow in the fluids of living tissues and produce poisons—*toxins of disease* as they are called, which are injurious to the structure of the body-cells. Different kinds of organisms invading our bodies are found to be responsible for different diseases.

Now, distinguishing as we have done, the living organism from its environments, we see that the causes of disease may be roughly: (1) Hereditary, or those arising out of defects in the original constitution of the individual, and (2) Acquired, or those produced by abnormal or injurious external circumstances. Thus, on the one hand a

ring; this is a natural process and does not probably constitute disease, and in old age possibly there is the cumulative effects of causes which have acted for long periods such as Degenerative changes in the blood vessels and in the joints.

(2) Sex—The existence of organs peculiar to either sex renders each liable to special diseases, e.g., Hysteria and chlorosis (one form of anaemia occurring in girls about the age of puberty) do occur in women only; on the other hand, women are comparatively immune to diseases like Addison's disease, Locomotor ataxy and certain forms of Progressive Muscular Atrophy.

(3) Previous disease and its effects—Some diseases when they have occurred once tend to recur again and again, e.g., Tonsillitis, Rheumatism, Erysipelas, Pneumonia and pleurisy; on the other hand, to have suffered once from certain diseases, especially general diseases, like Typhoid, Diphtheria and Small-pox practically secures immunity against a subsequent attack of the same disease.

Certain other diseases, again, like Malaria, Syphilis, Gout and Filariasis do modify considerably the functions of the body, and many years after attacks from these diseases it is found that illnesses seemingly at first sight to have nothing to do with them, yield only to the treatment appropriate to the original malady. This is explained by the fact that the causal agents of the original diseases are still latent in the body ready to flare up when the vitality of the body is in some way lowered by external conditions like injury or other influences.

Disease might terminate either by recovery or death. By "recovery" is meant the return of the part to the discharge of its normal functions; and by "death" is meant the cessation of all functions. Certain diseases can scarcely be said to have a termination, as when once established they remain stationary, and so long as the cause remains active the disease also continues.

Just as a body placed in stable equilibrium tends when slightly displaced to recover its original position, so also a cell slightly injured tends to resume its normal structure and function. If, however, the injury is too severe the cell dies. So with the organism as a whole; if the distur-

and is provided with suckers, which enable the worm to cling to the wall of the intestines. Each fully developed segment is a hermaphrodite, (combining the generative organs of both the male and the female in one). The worms are destitute of digestive organs and absorb their

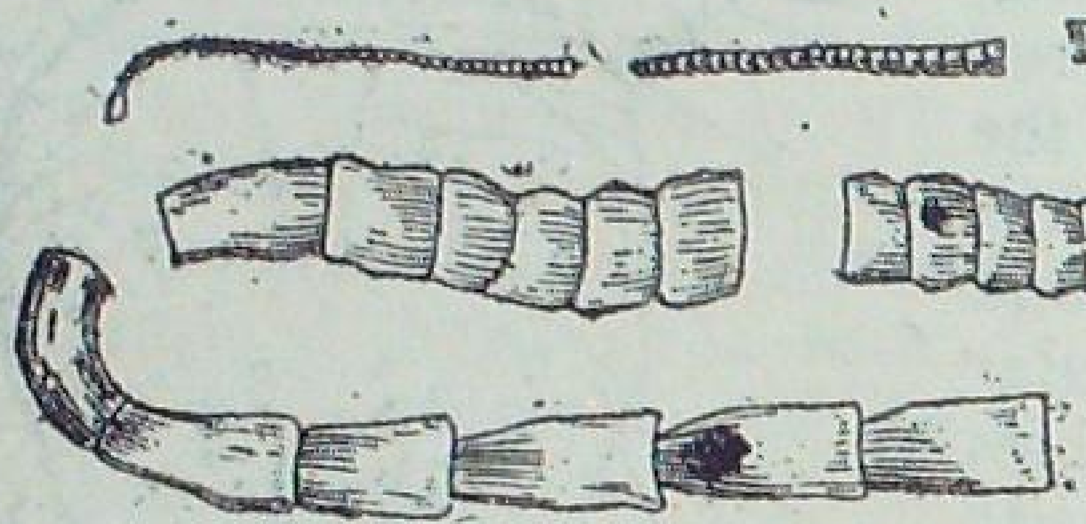


Fig. 7 (b)
Portions of T. Saginata.

nutriment directly from the intestinal contents of the host.

The life history of a tape worm includes residence in two hosts. The fully grown segments are broken off one by one from the parent worm and the ova which they contain are set free. If at this stage the ova are eaten by some animal capable of acting as the host of the intermediate form of the worm, the ova continue to develop in this intermediate host and an embryo with a few hooklets is set free. By means of these hooklets the embryo is enabled to penetrate the wall of the alimentary tract and by way of the bloodstream or some other route to reach some distant part; and when the pro-

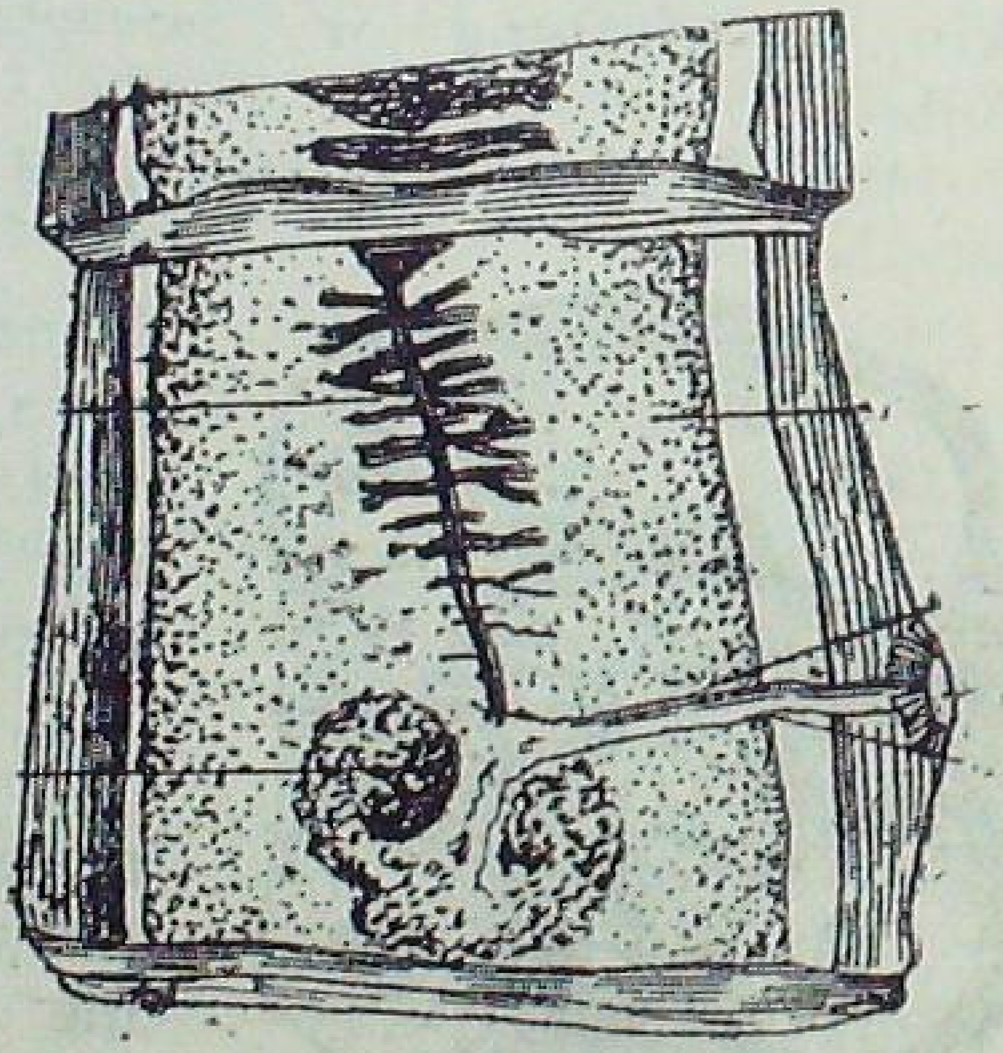


Fig. 7 (c)
A segment of the Taenia saginata containing both male and female organs × 40

The duration of life of the worms in the intestines was long in doubt, but recent observation in India by Mhaskar in Madras and Chandler in Bengal have shown that a rapid decrease takes place in the number of infected prisoners, who are living under conditions in which fresh infection cannot occur.

The effects of the presence of the worms in the intestines are very variable. In some cases even when large numbers are present no symptoms occur; in other cases the parasite gives rise to bleeding and anaemia—(miner's anaemia) as well as to colic and intestinal catarrh. Children suffer more severely than adults.

Epidemic anaemia was met with in French miners more than a hundred years ago, but it was in connection with a deadly outbreak among the workers at the St. Gothard Tunnel in 1880 that the disease was shown to be due to the ankylostoma duodenale. Important outbreaks have been observed in Austria among brick makers and in recent years cases have occurred among miners in Great Britain. The Geographical distribution, the epidemic or endemic incidence of anaemia, the occupation of the patient, presence of ova in the faeces are useful in the diagnosis of the disease.

An allied parasite—Necator Americanus (American murderer) is responsible for the disease as it prevails in America. This worm is smaller in size than the Ankylostome.

Prophylaxis of Ankylostomiasis or Hookworm disease. The prevention of this disease is, though apparently simple is difficult in practice among the indigenous people of the endemic areas, the chief obstacle being the primitive sanitary habits, poverty and ignorance. From the experience gained in Indian Jails that under proper sanitary conditions the inmates rapidly lose their infection, it is evident that proper disposal of faecal matter is perhaps the most powerful method of preventing the spread of infection. Chandler, as a result of extensive investigations in India suggests that European types of pail latrines are unsuitable for tropical indigenous labour on account of their rapid fouling, and recommends more primitive methods as have proved practical in some places in India,

tiasis Graecorum or leprosy). According to Manson the symptoms result from some departure from the normal in the life-history of the parasite, such as abortion on the part of the adult female, whereby ova instead of active embryos are liberated into the lymph stream. The ova are much thicker than the embryos and are apt to block the lymph channels at the glands; or again, the parent worm itself may obstruct the thoracic duct or may give rise to inflammatory obstruction of that duct.

Elephantiasis is by far the most common manifestation of filariasis. It is most frequent in adult life and in the dark races. There is a localised inflammation of the skin and soft tissue in the affected regions; the general symptoms include rigors, high fever, vomiting and even delirium, which may pass off after some hours or days with perspiration—Elephantoid fever or Filarial fever. At each succeeding attack of fever the thickness of the part is increased.

(2) *Chyluria*—A condition in which the urine suddenly becomes milky in appearance with a whey like odour. Occasionally it may be reddish from admixture of blood. The chylous urine often coagulates into a jelly after standing for some time, showing the presence of albumen, fat and fibrin, and microfilariae may be recognisable in the meshes of the fibrin. The attack may be accompanied by aching in the loins or interruption of micturition.

Chyluria is believed to be due to rupture of lymphatics in the urinary tract after these vessels have been obstructed and rendered varicose by the adult filariae and their ova. Chyluria comes and goes in the most irregular and unaccountable manner, and cure can scarcely be expected.

Manson recommends rest in the recumbent posture with the pelvis elevated and restriction of fluids and of fat in the food.

(3) *Lymph—Scrotum*—in which varicose dilatation of the lymphatics of the scrotum takes place resulting in the formation of numerous vesicles on the surface of the

11. PATHOGENIC MICRO-ORGANISMS

(Microbes or Germs of Disease)

For centuries man had lived in ignorance of the causes of infectious diseases; often such diseases spread so rapidly that in a few days or weeks thousands fell a prey to them; and even at the present day, in spite of our improved knowledge about them we see several serious epidemics occurring now and then. In recent years we had the great pandemic of the Post-war type of Influenza ("Flu") of 1918 and we still remember how thousands "flew" from this planet as the result thereof.

The great difficulty in fighting such epidemics is that even today little is known about the pathogenic germs that cause the infectious diseases and the way how they spread. This is especially true of such diseases as Influenza and Infantile paralysis. Nevertheless the great loss of life caused by such epidemics is becoming less and less in late years, as man learns more and more about germs and the ways of guarding against their attacks.

About 1607 it is that Leeuwenhoek (pronounced Lavenhok) first discovered plants and animals never before known, because they were too small to be seen by the naked eye and could be seen only by the high powers of the microscope. Their origin was at that time explained by the theory of "spontaneous generation;" that is, it was thought that these microbes grew spontaneously from decaying material and slime in which they were found. Then in 1785 or so Lazaro Spallanzani, an Italian scientist saw a one-celled organism divide, first in two new organisms, each again into two, and so on until they multiplied rapidly. Inspite of the fact that they multiplied in this manner it was still believed that these microbes arose out of the materials in which they thrived so well.

Next in the period of twenty years following the American Civil War of 1860 while the argument about the origin of the microbes was still raging amongst scientists, three great men, Pasteur in France, Koch in Germany and Lister in England proved conclusively that microbes were the cause of certain diseases, and that if they did not gain

reach a suitable place they multiply and produce the specific disease, and escape from the body and find another victim.

Most pathogenic germs are not able to live long outside the body of their hosts, as they do not find suitable medium to live on and multiply. Moreover, it is possible that some of them may actually be killed by the non-pathogenic germs contained in decaying animal or vegetable matter.

The majority of the epidemic and endemic diseases spread directly or indirectly from the diseased individual to another. Hence the most important and most dangerous source of disease-germs are the bodies of persons affected by the disease and also bodies of animals that are ill with diseases that can be transmitted to man also.

In some cases the infected person after recovery from the illness harbours the causative organisms, in which case he is termed a "carrier"; the carrier-condition is often present during convalescence, but it is generally not of long duration, the organism being eliminated or got rid of from the system soon after the individual regains his normal health. In the carrier the germs live in harmony with the host producing no symptoms of disease in him; yet they may still retain pathogenic properties for others. The carrier is, therefore, a constant source of danger to others, and if every carrier carried also the characteristic warning signs of disease, the control of the spread of the latter would have been much easier than it really is.

Bacteria leave the body of the sick in their discharges, the principal discharge depending upon the nature of the disease; those affecting respiratory organs are found in the saliva, sputum and nasal discharges, those attacking the digestive system are quite naturally discharged with the faeces and vomit; some may pass through urine as in the typhoid-carrier. Diseases causing eruption of skin often give out large number of germs on scales or discharges from the sores, and the germs of a few general diseases may be found in practically all the discharges from the body. Some kinds of germs, as of tetanus and

nately carriers do not present active signs or symptoms of disease, and if they did the control of infectious diseases would be much easier than it really is; in fact bacteriologists trying to prevent the spread of any infectious disease have found to their disappointment that persons apparently well may spread disease-germs wherever they go. Thus, persons who have had Diphtheria and Typhoid, and rarely people *who have never* been ill with any of these diseases have been found to be carriers of germs. A cook in New York was known as Typhoid Mary—she was *never sick herself* but she caused over 20 cases of Typhoid before it was discovered that she was the source of the germs. She was therefore compelled to give up her work. *Few years* later she was employed in a hospital where it is said "she caused many more cases of typhoid fever."

Some kinds of germs, as of Tetanus, are present in the soil and manure; being spore-forming bacteria they are able to withstand extremes of temperature and desiccation, and retain the power of multiplication and growth in the body tissues of man and animals when they gain access to them.

THE INFECTIOUS AGENT OUTSIDE THE HOST

A life-cycle outside the body of the affected host is obligatory in the case of many parasites: e.g., in the malarial organism this life-cycle takes place in the insect vector, the mosquito, and in case of the hookworm the life-cycle takes place in the soil. This obligatory period "between cases" in majority of the pathogenic bacteria is one of vicissitudes in their growth.

The survival or death of the bacterial agent *outside* the body of the host depends upon: the length of time that elapses between leaving the first host and the opportunity to reach the second, absence or presence of harmful environmental conditions, such as drying, high temperature, sunlight, dilution with soil or water and, as already mentioned, upon the admixture with other harmless or saprophytic bacteria (that is, bacteria living on decomposing matter of vegetable or animal nature).

Tubercular sputum has been known to retain its in-

genic microbes is "specific" and capable of yielding characteristic split-proteins.

The important diagnostic characters in the fever-charts of Influenza, Typhoid, Malaria, Relapsing fever etc., are thus explained. Thus, an intermittent fever at 48 or 72 hours' intervals suggests malarial infection, a fever of six days' duration followed by a remission for six days is generally suggestive of relapsing fever and stimulates physicians to search for a spirillum in the blood.

(3) Another general effect of infections is *fluctuation in the total and relative number of leucocytes in the blood*. Absolute and relative increase in the Polymorphonuclear leucocytes in the blood is the most usual of these changes and represents a positive chemotactic (attracting leucocytes) stimulus exerted by the bacteria. These polymorphos are the most active, though not always the most important defence-cells of the body.

[*Normally there are in one cubic millimeter of blood 5 millions Erythrocytes or Red blood cells—devoid of nucleus and 7000 to 8000 Leucocytes or white blood cells. The white cells are all nucleated. 70 p.c. of the total leucocytes are Polymorphonuclear leucocytes or simply Polymorphos, 3 p.c. euosinophiles, 5 p.c. Large mononuclears, 20–25 p.c. lymphocytes*].

The normal number of leucocytes in one cubic millimeter of blood is 7000 to 8000, and they may rise to even 30,000 or more in "leucocytosis." Such a rise is indicative of an inflammatory focus which may not ordinarily be apparent; in Typhoid fever there is a relative increase of lymphocytes. In diseases where hyper-leucocytosis is the rule its absence is indicative of a bad prognosis regarding recovery.

(4) *Destruction of Red Blood Corpuscles* is common in some form of microbic infection like Malaria, Typhoid fever, Bubonic plague etc.; and in most of such cases there is an *enlargement of the spleen*, which is of diagnostic importance.

(5) In prolonged infections like tuberculosis, chronic suppuration especially of joints, of the pleura and the peritoneum a kind of degeneration (Amyloid or waxy de-

unfortunate susceptibility both to the diseases of the carnivora and the herbivora, and has in addition certain diseases like syphilis, scarlet fever and measles which are peculiar only to man. In general it may be said that the variations in species—resistance depend probably on the temperature of the body and the food and the particular enzymes that are active in the host concerned.

A racial immunity is also present in certain varieties of swine and sheep to diseases ordinarily characteristic of these species; but the instances of apparent racial difference, that have been alleged in man are probably not authentic. For example, the fact that the Chinese are resistant to syphilis is probably due to a racial acquired immunity, and that the Mexican is resistant to smallpox is evidently due to their recovery from a disease, (alastrium,) which is quite similar to or a modified form of small-pox.

Individual resistance in a given race is also well recognised and may occur in those in the same age-group; e.g. certain diseases like typhoid have a characteristic age-incidence, occurring mostly in the young, and cancer usually in the middle-aged.

Acquired Immunity. It has long been recognised that recovery from certain diseases like Small-pox, Yellowfever, Typhoid and Bubonic plague practically insured the individual against the recurrence of that particular disease; a strong immunity, then, may be acquired by recovery from chance infection, or may be deliberately produced as was probably realised even in antiquity and among certain primitive people. Certain of the African Natives are reported to have used for generation a form of protective immunisation against Snake Venom, and Variolisation (inoculation of the matter from small-pox vesicles) against small-pox was practised in Persia and Greece as early as 11th Century, and probably in China long before that time and in India even from the Vedic times. It is well known that this method (which consists in producing a pustule in a healthy individual by inserting under the skin or in the nostrils the contents of an active pustule from the diseased) was not introduced into

Physiological Factors. (1) The protective action of the various secretions of the body which are discharged on the surface. These secretions abundant along the mucous membranes not only mechanically wash away the microbes and their toxic products but also restrain their growth and kill many of them. Thus, the ciliated epithelial lining of the mucous membrane of the nose, the larynx, the trachea and the bronchi and the genital organs and passages in the human body, has its peculiar protective properties against foreign irritants of any sort (including microbes). The nasal passages serve not only to warm and purify the inspired air breathed through them before its entry into the lungs but serve to mechanically filter it, through the hairy nares, and the mucous secretion arrest the particles of dust and other foreign bodies including microbes of disease.

(2) The skin and the sensory organs are the sentinels of the body; we have seen that the skin is very resistant; on that account nature has placed it outermost in the body; its delicate sensory terminals warn us of injury from outside. Having the power of regulating our body-heat the skin is capable of adjusting itself to varying changes in the external temperature and to atmospheric pressure through its elasticity; when injured in the daily struggle for life the skin produces immunising substances and in this respect is a most important organ; and any irritation acts in large part by calling up the immunising powers of the skin. The skin should, therefore be kept in good state by daily massage and exposure to sun and open air. The glow and fine texture of the skin of a warrior or of a race horse are proverbial.

Sunburn is a superficial injury and is quickly followed by repair.

(3) Certain physiological reflexes, like winking of the eyes, sneezing, coughing, vomiting and even diarrhoea are all attempts of Nature to guard against foreign invasions. A mote in the eye is washed out by the increased flow of tears it sets up, irritants entering the nose cause sneezing, and a foreign substance inhaled into the larynx or wind pipe is got rid of by coughing. Even the sight of unwholesome food causes retching and if taken into the stomach

4. VITAL FORCE AND ITS CONSERVATION

Probably no subject connected with preservation of health or prevention of disease is at once so important but at the same time so little understood as the conservation of our vital forces. We are all aware of the importance of having a good sum of money in reserve with a Bank, as the relations of man to man in these days of civilisation are such that money is practically indispensable to accomplish our purpose in life; and vital force is of no less importance in the physiological domain of man's existence. But there is this difference: one can easily know whether in the case of a Bank more money is being deposited than is being withdrawn, or can know if perchance the drafts have been in excess of the deposits. Not so in the matter of transactions with the Bank of Life. The human organism, we have seen, is largely a self-regulating machine and is so constructed that if excessive drafts during youth and middle life are made upon the vital forces a corresponding provision is also made by nature and the required amount of vital force is forthcoming; moreover, no explicit sign is given the individual that life's forces are being withdrawn and that the drafts on the Bank are in excess of the deposits.

Now, the sum-total of the vital force of each individual depends upon the amount of vigour which he has inherited from his parents and also upon the temperateness and the kind of life which he leads. We are often surprised to hear that men esteemed to be robust and vigorous succumb to death even after a slight illness; while men who have been ailing from childhood and never robust or enduring, but who have been naturally obliged to take proper care of their health and to guard against unhealthy influences usually continue the battle of life even to old age. The explanation is easy. These robust people who succumbed so easily to disease have been accustomed in early life and perhaps for years to issue far greater drafts on the Vital Bank than they had made provision for and have constantly on that account been running short of their stock of vital force; so that when subjected to a severe trial physical bankruptcy and death

Malaria, Yellow-fever and several other diseases are transmitted by the bites of bloodsucking mosquitoes and other insects. Flies may carry infective material on their legs, this material they may carry to articles of food upon which they alight. Animals suffering from Hydrophobia may transmit the disease by biting human beings.

In the management and the prevention of the spread of disease there are several procedures which apply more or less generally. *First,* all cases of infectious nature should be reported at once to the Health Authorities. This is required by Law in most communities. The necessity for this depends on the fact that most persons are apt to be careless about the health of other persons and will not, unless required by Law, adopt proper precautions to avoid the spread of any infectious disease with which they may be afflicted. When the case is reported, the Health Authorities should see to it that the patient is cared for in such a manner as not to endanger others. This is accomplished by the use of such measures as Isolation, Quarantine, Disinfection, Vaccination and Destruction of vermin, mosquitoes, rats etc.

The value of isolating a patient with an infectious disease rests on the fact that the disinfection of the discharges cannot otherwise be guaranteed, nor persons who might visit the sickroom be prevented from coming in contact with infectious agencies.

Quarantine is only a more complete isolation of the patient. Isolation refers to the nurse and patient, Quarantine refers to the premises and all persons within the premises.

Disinfection is the art of destroying the disease-producing organisms, which exist in the infectious material.

In diseases such as Diphtheria, Pneumonia, Influenza, Colds, Scarlet fever, Tuberculosis etc., which are spread by the discharges from the nose and the throat or by the excreta, the greatest care should be taken to burn all the discharges and all objects which may contain them, or to chemically destroy the infectious organisms.

In former times it was always customary to disinfect all the rooms and premises where infectious cases had been

the thorax carries dorsally (back part) two pairs of wings, a pair on each of the 2nd and 3rd segments of the thorax. Hence the insects are named Diptera. These two pairs of wings may, however, be modified or be rudimentary or even absent. Thus, in beetles the front wings are hardened and act as shields for the protection of the hind pair of wings, which are the actual functioning wings. In the fly and the mosquito only one pair of wings is present, the hind pair being rudimentary, and in the louse and flea the wings are absent altogether.

The abdomen of insects consists of several segments and is devoid of any appendages except the genital organs.

The development of insects is somewhat complicated. Insects *lay eggs*, the egg after a certain period hatches out into a *larva* (or grub or caterpillar stage). The larva grows rapidly in size, moults several times and finally becomes a *pupa* (chrysalis stage). This stage is the resting stage during which parts of the mature insects are gradually evolved; after a certain period the *mature* insect emerges out of the pupa.

There is no sex differentiation in the immature forms of the insect as the sexual organs are not fully formed. It is only in the mature stage that the insect is differentiated into the male and the female.

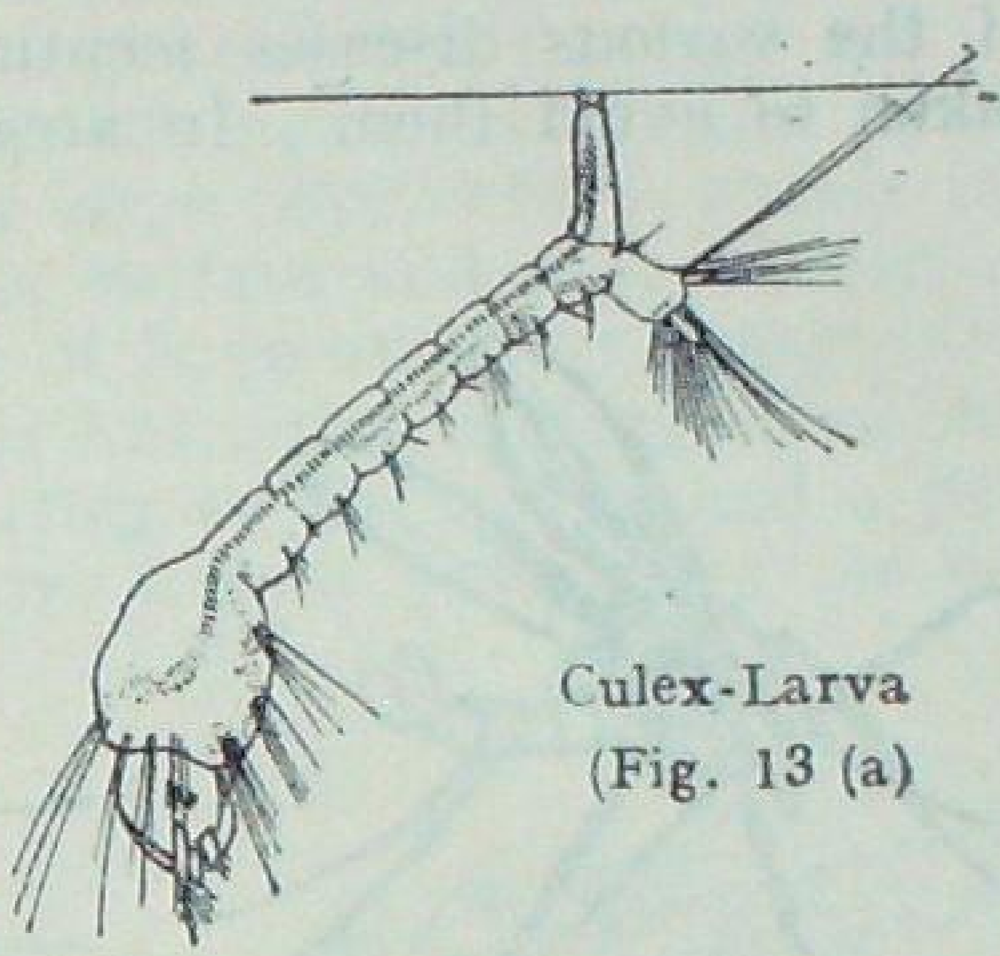
Ordinarily the larva and the pupa are never like the mature parent insect as in the case of mosquitoes, flies and beetles; on the other hand in some forms of insects, such as the bug, the louse and the cockroach, the immature forms closely resemble the mature ones, though much smaller.

The common insects concerned with the transmission of disease to man are:

(1) Mosquitoes and flies (N. O. Diptera).
(2) Bedbugs (Rhyncota)
(3) Lice (anaplura).
and (4) Fleas (Siphonaptera).

The mosquito and the common housefly have mouthparts capable of taking up only liquid food. The mosquito, however, is able to pierce the skin and suck blood, but the housefly can only suck exposed fluids.

generally seen in dark corners and damp places. When disturbed it flies away with a hopping movement. It is recognised by its small size, fragile appearance and thin lanky legs. When resting its wings are held erect. (Fig. 14).



Culex-Larva
(Fig. 13 (a)

The fly has a dense covering of fine hair over the entire body and the wings, and this is a characteristic of this group. It has its mouth-parts adapted for piercing and sucking, and like the mosquito only the female is the bloodsucker.

Sandflies frequently attack man, and in some places form a terrible pest. Their bites are painful. Being so minute they are able to enter the ordinary type of mosquito curtain with ease. The insects are nocturnal in habit and may occasionally be seen attracted near lights at night. Sandflies breed in damp mud mixed up with organic matter. The eggs are minute and laid in damp mud in dark places and hatch in 4 to 6 days. The larva is caterpillar-like and is devoid of legs. It feeds on organic matter in the mud and is transformed into a pupa, which matures in a few days.

The common diseases in man known to be transmitted by the sandfly are:

(1) Sandfly fever (Papatassii fever)

(2) Oriental sore (Delhi-Boil)

(3) Kala-azar. The parasite of kala-azar has been recently demonstrated in the foregut of a species of Phlebotomus common in most parts of India, and it has been suspected that the sandfly transmits the parasite to healthy people through its bite, but the final opinion that the actual transmission is due to the bite of this fly is yet to be established.

eggs hatch the fly-larvae emerge from them. These are the maggots commonly seen in decomposing matter or dung. The larva is long and tubular, white or yellow in colour with a tapering front end and a thick and truncate hind-end. The pointed end is the mouth-end, the larva being devoid of a head.

On the hind-end are two dark plates which form the openings of the breathing system of the maggot. The maggot feeds actively on organic matter, moults several times, becomes transformed into the pupa (chrysalis), which is the inactive resting stage. After a certain number of days the mature fly emerges out of the pupa by a circular opening at one end of the pupal case.

Flies cause diseases chiefly by mechanically transferring disease-germs on to our food. As flies feed with equal relish on both filth and human food they commonly transfer various disease-producing germs from filth, sputum, pus etc., to food, milk or sugar. Numberless bacteria can stick to the legs, body or the proboscis of the fly; and when the fly walks on foods or utensils the bacteria are deposited on them. Millions of bacteria may thus be carried by flies on to man's food. Studies made in New York some years ago showed an average of 14,000 bacteria on the outer surface of bodies of flies from *"clean"* localities as compared with an average of one million on flies collected from *dirty* surroundings. Both Cholera and Typhoid germs have been isolated from the bodies of flies.

Another factor that increases the chances of infection is the habit of the fly to deposit its faeces while feeding. Often swarms of pathogenic bacteria pass out unaltered in the faeces of the fly, and if the fly had previously fed on infective material, our food might get contaminated with bacteria, contained in the faecal deposit of the fly.

Another dangerous habit of the fly is the regurgitation of food. When it feeds on any food (only liquid food) the fly draws it first into a large chamber known as the "crop." This crop acts as a reservoir into which the food is stored especially when the fly feeds in a hurry, and later at leisure it may bring back the contents of the crop

of the latter ticks, which come out of their resting places only at night and get back again after feeding. The hard ticks, on the other hand are more or less permanently fixed on to the host.

In India ticks are not known to cause much injury to man. But it is known that people frequenting jungle areas are frequently attacked by ticks. In a few cases such visits to jungle infested with ticks are followed by attacks of *Tick-typhus*.

Ticks are also responsible for the transmission of *Relapsing fever* in several parts of the world.

F. BED-BUGS (Fig. 19)

Bugs form a very large Zoological group consisting of several thousands of species; but we are concerned only with the bed-bugs that attack man.

Bed-bug (cimex rotundatus) has a flattish smooth body which enables the bug to get into crevices in wall and furniture with ease. It has three pairs of legs and has no wings. The mouth parts are adapted for piercing the skin and sucking blood; the latter are in the form of a proboscis, which is bent under the head and kept concealed between the bases of the legs. The proboscis is not ordinarily recognisable except when the bug tries to bite. This blood sucker, although

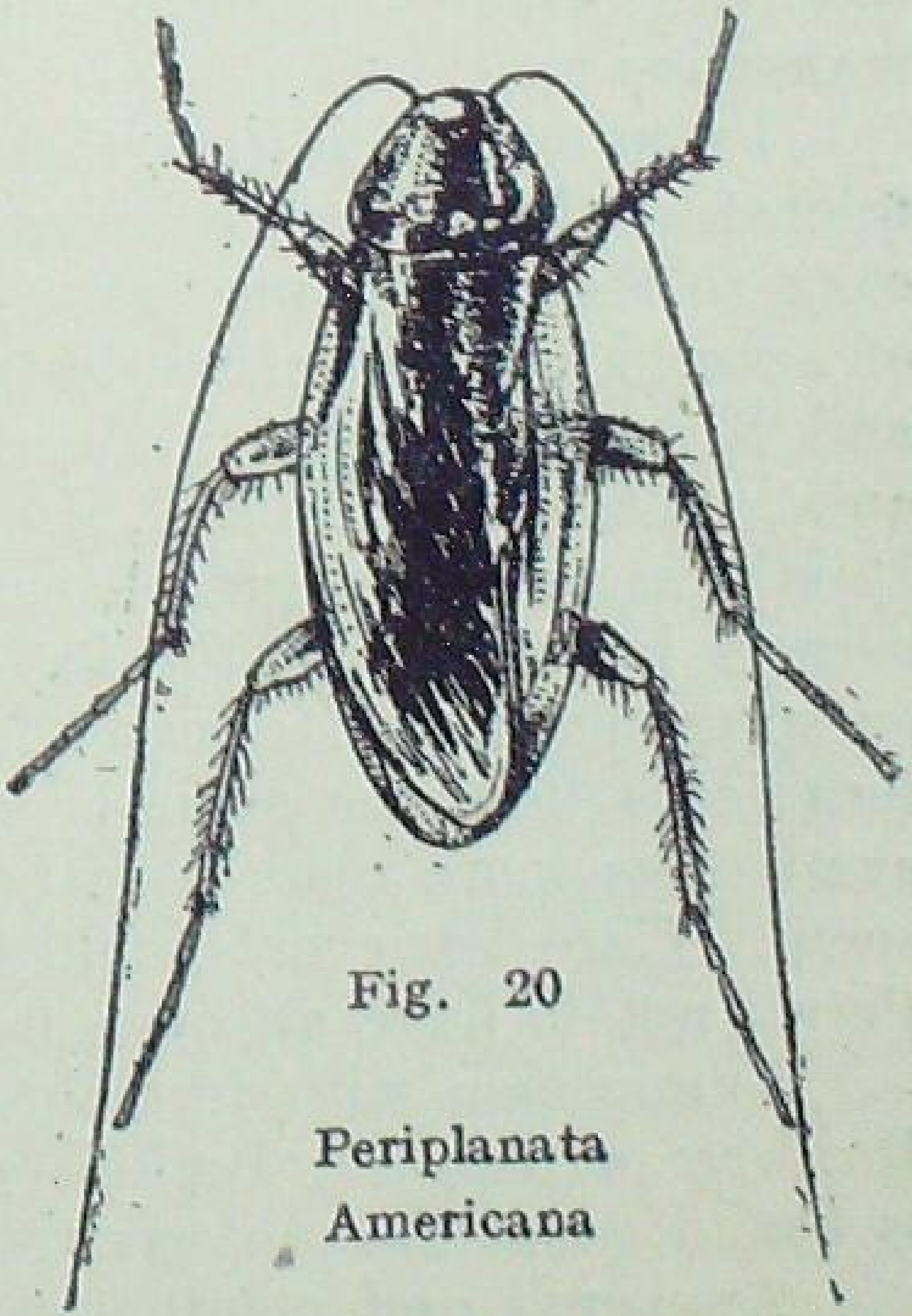


Fig. 20

Periplanata Americana

As an insecticide D.D.T. owes its outstanding success to four important properties: at the strengths normally employed it is non-poisonous to human beings, domestic animals, poultry, fish and earth-worms, it is insoluble in water, unaffected by light and it is chemically stable, so that it retains its toxic properties on sprayed surfaces for several weeks.

Here are some of the diseases against which D.D.T. is particularly effective; typhus, malaria, dysentery, enteric, cholera and plague. It acts on insects both as contact-poison and as stomach-poison although it is non-toxic, as we saw, to man and other warm-blooded animals. D.D.T. works by striking at the carriers of the disease and can kill body lice, ticks, mosquitoes and flies which spread dysentery, enteric, cholera and the plague, while it has been used successfully to destroy bugs, fleas, cockroaches, beetles, cabbage worms, and aphides (green flies), red spiders and apple saw-fly.

Now, the enormous strides in the development of insecticides and the vital part they have played in the war have raised great hopes of a new era in the control of insect pests of crops and stock and of insect-borne diseases of plants, animals and men. It does not seem out of place (says the Editorial in the Planter's Chronicle for April 1945) to sound a note of warning against undue optimism. There are many pitfalls in the use of insecticides and the more powerful they are the greater the complications which may arise from their extended use. Some of these complexities appear when we consider a report recorded that an area of country several square miles in extent had been treated with D.D.T. from the air and the mosquitoes in the area effectively destroyed. Such wholesale treatment may be thoroughly justified in an emergency and in areas not of agricultural importance; but one would hesitate to forecast what the eventual results will be and whether in fact the treatment will raise more problems than it solves. With such a powerful insecticide as D.D.T. it will not be only mosquitoes which are killed, but other insects also which are not harmful; indeed many are directly or indirectly beneficial.

next in the last weeks of pregnancy when the advancing head of the foetus encroaches upon the area into which the bladder nearly extends.

Direct pressure of the pregnant uterus on the rectum is uncommon because the uterus is normally inclined to the front. It is generally stated that the liver, the kidneys and the stomach are not affected by the growing uterus. But functional disturbances of the stomach and the intestines are so frequently associated with the later months of pregnancy when the top of the rising uterus approximates the stomach-area that some mechanical interference with the normal motility of the stomach and intestines does give rise to flatulence, hyper-acidity etc.

The height of the fundus uteri (top of the womb) is a valuable guide to the progress and duration of the pregnancy especially in the absence of an accurate menstrual history. Normally the fundus should reach the level of the umbilicus (navel at the VI month, midway between symphisis pubes and the umbilicus at the IV month, midway between umbilicus and the xiphisternum (ensiform cartilage) at the VIII month, and at the xiphisternum at the IX month. After the IX month the normal settling process of the womb usually carries the fundus down to the level of the VIII month. White lines (lineae albicantes, striae gravidarum, lines of pregnancy) do generally appear on the abdominal wall by distension and rarely on the thighs.

The reactions of pregnancy on the breasts appear early, and the signs and symptoms referable to them serve as valuable corroborative evidence in the diagnosis of pregnancy. The patient often complains of tenseness and sensitiveness in the breasts particularly around the nipple, often similar to that present in the breasts during menses, and generally felt as early as the III month. Itching is an occasional symptom and appears at later months when the skin becomes stretched. What are known as Montgomery's tubercles appear very early in a large number of cases. This is a constant sign. The tubercles are hypertrophied sebaceous glands arranged concentrically within the areola (dark ring around the nipple) and becoming

and an unusual degree of nervous fatigue may be exhibited.

1. SIGNS AND SYMPTOMS OF PREGNANCY

A thorough familiarity with the effects of pregnancy upon the maternal organism as outlined above might serve for the recognition of pregnancy. In a large majority of cases the patient makes her own diagnosis. An early and dependable diagnosis is desirable in every case so that the woman might make the necessary preparations and adaptations to the new responsibilities involved. In certain cases for example, where the question of marriage hangs upon the diagnosis an early and accurate statement becomes urgent. Yet the medical attendant must care for his own reputation and withhold a dogmatic opinion until the diagnosis is correct beyond doubt. The unpleasant results that may arise from a mistaken diagnosis of pregnancy for the patient and her friends and relatives must make us pay proper attention to this point.

The various Signs and Symptoms of pregnancy are:

A. The Subjective symptoms, of which the patient herself acquaints us. They are, (1) *Suppression of menses* (or Amenorrhoea). As a rule the first thing that suggests to a woman that she is pregnant is this change. Of course suppression of menses may also result from anaemia, tuberculosis and ovarian disease; but if the condition occurs in a married woman in otherwise good health who has been menstruating regularly, and if the stated period of amenorrhoea corresponds with the size of the uterus and with the other results of physical examination, amenorrhoea has a diagnostic value. Otherwise its value is small. It must be remembered that in rare cases even after conception has taken place the woman may continue to menstruate once or twice.

(2) *Quickening*. This is the sensation the woman experiences when she detects the movements of the foetus for the first time during pregnancy. This sensation is comparable to the fluttering movement of a small bird when held in the hand. Such a sensation, however, can readily be simulated by other causes such as movements of the

journey can be completed, and on the special peculiarities of each patient that it is not possible to lay down more than general rules.

CARE OF THE TEETH

Regular cleaning of teeth important at all times in maintaining perfect health, is especially so in pregnancy. Their cleaning at least twice daily should be enjoined, but better still after each meal. A good cleansing material is Prepared chalk or even Bicarbonate of soda. Teeth that are decayed should be filled or pulled out at once. The importance of diet in the preservation of the teeth has been previously referred to.

CARE OF THE BREASTS

Preparation of the breasts for suckling should begin about the 6th month. If the nipples are flat they should be drawn out by the finger and thumb for a short time each day. The nipples too should be kept clean by daily washing them with soap and warm water to get rid of the crusts of dried secretion that tend to form on them. If towards the end of pregnancy the breasts feel uncomfortably heavy they may be supported by a sling, but they should never be tightly constricted or subjected to constant pressure by the clothing. Rough manipulations should be avoided as they may result in small lacerations which may become infected.

CARE OF THE BOWELS

Constipation. This is probably the most common disorder to which pregnant women are liable and is largely due to taking too little fluid and restricting outdoor exercise. It is of the first importance to secure a free action of the bowels at least once daily; and by far the best time is immediately after breakfast and an attempt, even if it is not always successful, should be made at that time. In fact the successful development of a habit-time for evacuation of the bowels minimises the need for all artificial stimulants.

In the prevention and cure of constipation proper exercise and diet are most important rather than drugs.

regarding the care about themselves and the coming child. If mothers desire for healthy children they must lead healthy lives. Yet we see pregnant women being in a tense atmosphere of excitement, eating unsuitable food and being indiscreet in so many ways, sitting up late at night, wearing their nerves to shreds and generally behaving in ways best calculated to give them a neurotic and sickly child. Some women all through the pregnancy are in a chronic state of auto-intoxication by food poisoning, that is to say, that the waste products of food are poisoning them. This condition causes a state of nervous irritability, and children born in these circumstances will not be happy and healthy. Mothers, who during the critical period just before child-birth do not lead healthy, sensible normal lives cannot expect to have healthy sensible normal children.

Miscarriages and premature confinements are due to excitement often of a sexual character. A mother should be allowed to forget about the sexual life, while in the pregnant condition; but ignorant and selfish husbands do not either realise this, or do not care if they do.

In respect of sexual intercourse after conception has taken place in the female man has to learn from the lower animals. The female animal will not allow access to the male except during the "rut" and never after conception has taken place; and if this analogy of the lower animals and many savage races is to be followed coitus should be entirely forbidden even from the earliest months of pregnancy.

There are other excitements which the pregnant woman should avoid, such as the excitement of family quarrels. Sometimes women grow peevish and irritable particularly during pregnancy, and work off their nerve tension by picking silly quarrels for trifling reasons. This is highly injurious to the baby in the womb and must be avoided.

Some women are so afraid of missing social functions that they continue to go to parties and on visits to friends until they are near confinement. This kind of excitement saps the nervous energies; and in fact any sort of excite-

it is the method Nature has evolved and the one on which the race has survived.

Breast-feeding has several advantages over artificial feeding:

(1) On breast-feeding an infant will frequently show a satisfactory gain, say of 2 lbs., a month, on much less quantity of breast milk than on artificial feeding. It is believed also that better development of the jaw occurs with natural sucking and that the right temperature of the breast-milk prevents any risk of damage to the developing teeth.

(2) Breast-milk protein is more adequate for the growth of the body than cow-milk or goat-milk protein. 2 Grms. of breast-milk-protein being equivalent to 3½ to 4 Grms. of cow or goat-milk-protein. This fact considerably lessens the work of the digestive apparatus. Certainly feeding difficulties are much fewer with breast-fed than with artificially fed infants, and affections like summer-diarrhoea causing a high infant-mortality do occur almost entirely on artificially-fed infants, because breast milk is more easily digestible and is more free from pathogenic bacteria.

(3) Breast-fed infants do resist infection of disease better and have better general health than the bottle-fed. Infact it has been proved that immunity against various diseases and infections is transmitted from the mother to the infant through the breast-milk.

The excretion of vitamins in breast-milk is usually of no vital importance as long as the mother is on an adequate intake. Breast-milk ordinarily contains enough Vitamin A and B but Vitamin C and D must be added. If the mother receives inadequate amounts of Vitamin A and B in her diet the amount in the breast-milk may decrease and become inadequate.

(4) In many instances breast-feeding is simpler and more convenient than preparation of artificial food. This is especially true in poorer homes where facilities for preparing the food and keeping it are poor. In homes where there are servants to work the mother of course may gain little in the matter of convenience for breast-feeding but

should be remembered however, that cow's milk is satisfactory only because it meets most of the requirements of a good diet, yet, it will be seen, cow's milk being deficient in Vitamin C and D has to be supplemented with an additional source of Vitamin D by way of Cod Liver Oil, and of Vitamin C in the shape of fresh fruit juice (orange juice or tomato-juice). Cow's milk, therefore, survives as the most important basis of artificial food for infants, because, in no other way can a complete diet for an infant be provided so easily and economically as by the use of Cow's milk with added Carbohydrates like sugar and cereals.

Cereals are usually the first solid foods added to the infant's dietary. The age at which they are added varies in different localities, the most frequent age being the 5th month. Apparently the average baby has no digestive disturbances clearly due to cereals at this period at any rate.

The purpose in adding cereals is to teach the child to take solid food and to amplify the protein, the mineral especially the Iron-intake and Vitamin B (antineuritic factor); infact, if the addition of cereals is made at this age (5th month) the margin of safety as to Iron deficiency on milk diet is adequate.

The addition of cereals, moreover, makes the "clotting" of milk in the stomach more flocculent and easily permeable to the digestive juices.

The cereals most commonly used are wheat, oats, rice, barley, corn-maize and ragi. The cereals used must be the wholeground cereals, so as to retain all their mineral salts and vitamins. The choice of a cereal to be used in supplementing the milk diet is usually dictated by convenience and availability, points to be considered being Iron, Vitamin, Protein and fibre-contents.

The proteins of cereals especially of corn-maize are "incomplete", in the sense that they are deficient in one or more of those amino-acids (like leucine, tyrosine, tryptophane etc.) which are essential for growth. As supplements to milk proteins, however, they are valuable and are utilised. This is of more importance in the diet of

of feeling engendered. It is therefore aptly termed, "the golden period of life." Children who are properly reared by understanding parents, who are taught to face reality, to adjust to situations as they find them, to accept without protest "the pleasure-pain colouring of life", to learn that failure is only a normal part of life,—such children seldom turn out neurotics when they grow up. So also children who are taught self-discipline and who have inculcated in them the sense of good taste and sportsmanship.

Parents should consider that though the child is their own a life has been entrusted to their care, which they should influence in such a manner that the individual grows up into a useful and happy person in so far as the existing environments and the inherent nature of the child will permit of such development.

Children must be given a feeling of security, for this end it is necessary that there should be no friction between the parents themselves; and the children should not be allowed to become aware of financial or other forms of insecurity which might trouble the parents.

Children ought to be allowed a considerable freedom and initiative in order that they may develop their own latent powers; they must be allowed to take reasonable risks. "It is better to risk a child's life than to endanger his spirits."

Parents should live such a life as will furnish an ideal for the child to copy and to understand what are the desirable traits in man's character. In other words, the parents are the child's ideal, their actions will speak louder than their words and will have better influence in the process of training.

Parents should maintain a friendly relationship with their children, try to meet them on a youthful level, comprehend their reactions and exert their influence by virtue of friendship and respect rather than by employing the powers of a dictator.

The child must be taught self-discipline. This is far more important than any discipline which the parents may impose. Arbitrary discipline is the resort of a lazy, fre-

make the home a place where children would like to congregate. If there is only one child in the house it is advisable to allow him the company of other children of the same age as far as possible, as often children who have no brothers or sisters are markedly handicapped in their adjustment to life.

One should do everything possible to broaden the child's knowledge of the world. This can be accomplished through reading, conversation or best of all through travel.

When they grow older, children should be sent away from home to boarding schools, to camp or to visit their friends. Don't be afraid they might pick up bad habits; perhaps they might, but they had better be subjected to these influences during the period they are in touch with their parents than later on.

Parents should not be too upset by the minor difficulties of their children; they should remember that they (children) pass through phases during which they are at times difficult to control. Luckily those phases are short in duration. Be therefore patient with children and help them to handle their difficulties in adjustment.

* * * * *

It may be seen from the above résumé that both constitutional and environmental factors play their part in causing the difficulties of child-rearing, and it may be stated as an axiom that one of the most frequent causes of serious problems of adjustment occurring in children is the absence of a normal home-life. This absence is the result of either the parents being separated, or dead, or the friction between parents being so great as to practically constitute a broken home.

It is of interest to note that children reared by neurotic parents are very apt to be neurotic themselves. This is particularly true if either or both of the parents to whom the children may be closely attached are neurotic also.

AN APPRECIATION

It is a recognised fact that within recent years knowledge in Preventive Medicine has greatly advanced and that increased attention is being paid to this subject in all civilised countries in the world. In India, our people do not lag behind any other nation in the world as regards personal hygiene and are fully aware of the great importance of building up a sound and virile body, but, I am afraid, we do not appreciate much the importance of what I might be permitted to call "Community Hygiene" or hygiene of the people as a whole. This is due to ignorance, apathy and want of correct knowledge of the subject of Hygiene, and it is therefore our urgent need to educate the people, specially the young, in this important subject. Absolutely preventable diseases are taking a very heavy toll in mortality figures every year in India and are in addition undermining the health of many more, so that, instead of being able to earn their own living and maintain their families, become themselves a heavy burden on their families or the nation. This is a heavy and economic loss to our Country and it is our duty to grapple with this problem.

This duty has been amply fulfilled by my friend, Dr. M. A. Kamath, in a comprehensive manner in this treatise "Towards a Happier Life." It is written in simple, instructive language which can be easily understood by laymen. Having had a wide experience in teaching medical students and having been an author of several other medical works, he has been able to bring this mine of information within reach of all people, and I am sure it would benefit greatly those who study its contents.

I really think that Government should make it compulsory that every High School in the Presidency should have as full or part-time teacher, a well qualified medical man on its staff, and it should be his duty to teach the young minds the contents of this book.

All the various chapters are well conceived and arranged with a view to give full and up-to-date knowledge in each subject and are self-contained. The last

possible forty years ago, and the purpose of Sanitary Science is to teach people the causes of disease—how to prevent disease, how to live without being sick, how to increase the vital force—how to avoid premature decay. And one of the most useful reforms that can be introduced into Society in these days is that the advice of the Physician should be sought for and paid for, as is the prevalent custom in China, only while in health to "keep the patient well" and not as now, while in sickness to cure disease, which in most cases could be avoided or prevented.

It is mainly with this objective that the following pages are written, also with the hope that our educated readers will derive such benefit therefrom as to help them, and through them the masses, on "Towards a Happier Life."

My thanks are due to my sons Sri M. V. Kamath, M.B.,M.S., D.G.O., and Sri M. Mohan Rao, M.Sc. (Agr.) for their help in the preparation of the Book.

Mangalore

M. A. Kamath.

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ced and proper diet is absolutely essential for sound health, endurance and efficiency, under-nutrition and faulty diet continued for a length of time lead to diseased condition now and degeneration of the race hereafter. If the Indian people are to grow in physical vigour and strength and compete successfully with other nations physically, intellectually and commercially they must reform their dietary, that is, correct their diet deficiencies and make a proper selection of food in accordance with modern ideas of nutrition. A general survey of the dietary habits of mankind brings out prominently one fact, viz., those races whose diet is chiefly carbohydrates like rice and other cereals have the poorest physical development, and those whose diet is rich in proteins and milk and its products develop a high degree of efficiency and endurance. This broad principle finds a splendid illustration in the many Indian races whose difference in their physical efficiency depends more on the character of their food than anything else.

Now, what constitutes a well-balanced diet? The food to be complete and nourishing should contain all the elements necessary to build up the body, especially the proteins, carbohydrates, salts of Calcium, Phosphorus and Iron and vitamins.

The diet should be varied and should include milk or its products, eggs, fish, whole-wheat flour in preference to the refined white flour, wheat or ragi in preference to rice, leafy vegetables and fruits. Rice is at best a poor food and when milled and polished is still more reduced in its food-value and cannot supply the nutritive needs of the body. Milk is the most perfect food for growing children, for which there is no efficient substitute. Curds and butter-milk have also certain specific values of their own. This country should produce more and better milch-cows; the dairy industry is a very economic method of producing more food and good food. The wheat should be ground whole so as to include the germ of the outer layers of the grain, which contains fats, proteins, mineral salts and enzymes, which are so essential for digestion and health in general. Brown bread or whole-meal bread is,

The resources of India are, no doubt, immense, but they can become available for the betterment of the people only through a well-planned organisation of economic development. Agricultural, irrigation and veterinary research and the application of their results to the problems of the Country are gradually being extended by the Government, and their efforts are already bearing fruit. Large tracts of land have been brought under cultivation, the total area under cultivation of food crops such as cereals being about 200 million acres.

Agricultural Research, for example, has within recent years covered a wide field such as protection of crops from pest and disease, irrigation, fertilisers, soil examination, etc. Also the most important question of co-operation of agricultural and nutritional studies for the improvement of human nutrition is now being actually pursued.

A study has recently been made at the Nutritional Research Institute, Coonoor, by Dr. Aykroyd of the food supply and nutritional requirements of the population of the Province of Madras, and the conclusion has been reached that the food available is just sufficient to cover the energy-needs of the people provided it is evenly distributed, and that the average diet, which consists mostly of cereals, is lacking in animal-proteins, mineral salts and vitamins, which are so essential for the proper physiological functioning of the body. Milk, eggs, fish and meat would supply the required animal protein, whilst green vegetables and fruits provide the essential vitamins and mineral salts. These latter, which have been termed "protective" foods are, however, relatively more expensive than cereals, and ordinarily they are eaten in very small quantities, or are entirely absent from the diet.

These investigations are of particular value in assessing the actual position in regard to the nutritional requirements of the population, which include the provision of adequate quantity of food and of a desirable level of quality; and the same remarks apply equally to most parts of India.

The investigations have also demonstrated a wide-

the State to supply free services to the people. We have fortunately at present in all the Indian Provinces a Government pledged to radical social policy and we may hope they will follow a well planned economic policy to raise the general standard of living and also take active steps to improve the sanitary environments of the people. The New Public Health Act lately passed by the Madras Government is a very important measure containing many useful provisions calculated to advance the public health of this Province; but, for the successful working of the Act, or any Act whatsoever, the co-operation of the public with the Government is quite essential.

Maternity Mortality. Maternity, which should normally be a physiological function for the woman attended with little risk to her health or life, claims in India a heavy toll of lives. The total number of deaths from childbirth during 1936 in India was 160,000; during 1935 the percentage of women disabled as a result of pregnancy and labour is about 30, which means nearly 300,000 women are temporarily or permanently incapacitated annually, taking 1,000,000 as the average annual birth-rate. The maternal mortality-rate per 1,000 live-births in India has been estimated to be about 20 in comparison with 3·8 in England and Wales in 1936; and the tragedy lay in the fact that a large number of these deaths, say 80 p.c. is certainly preventable. Enquiries conducted in Calcutta and Bombay have revealed that anaemia associated with pregnancy and eclampsia are two of the main causes of maternal mortality, and special investigations have been opened by the State concerning them.

India and the Rest of the World. A study of the mortality figures for British India shows that about 49 p.c. of the total mortality in a year is among those people who are ten years of age, whilst the corresponding figure for England is only 12 p.c. During the first year of life India's proportional mortality is about 3½ times that of England. At the next period, between 1 and 5 years, it is five times greater and between 5 and 10 years it is three times as high. About 25 p.c. of the total deaths were among infants under one year, the English figure being

the Earth's surface which possess a cool, fairly moist and moderately changeable climate are precisely those where human civilisation has reached its fullest and richest development. Constant and equable climates, on the other hand, especially when warm and humid tend to produce a weak and languid race of men.

Moist climates are undoubtedly less healthy than dry ones. Decomposition is only possible in the presence of moisture in the air or in the soil, and microbes multiply more rapidly and are more abundant in moist air than in dry air. Evaporation from the skin and the lungs and the capacity for exertion are also decreased by excessive humidity of the air.

1. WATER SUPPLIES AND THEIR PROTECTION

Among all the problems of sanitation that of a pure water supply stands foremost and even the earliest organised life of man centred round a spring or river which made possible the establishment of a permanent settlement, and the River-gods were, therefore, the most ancient and honoured dieties of mythology.

The original source of all water supplies is rain, formed from water distilled by sunlight from the surface of land or sea, from the leaves of plants and bodies of animals; and as the rain falls through the atmosphere it absorbs various gases and washes the atmosphere free of inorganic and organic impurities, giving the brilliant clear air familiar to us after a heavy shower.

From a sanitary point the rain before it reaches the earth is, however, of a high degree of purity containing only an infinitesimal fraction of suspended and dissolved material and is practically free from microbes, at any rate disease-producing microbes. But it is when the rain actually strikes the surface of the earth, the cultivated fields, farm yards, unclean streets of the towns and dump heaps that the water changes its characteristics as it sweeps along in its course suspended material, dissolved material and bacteria, among which in places of human habitations intestinal bacteria and ova of worms are almost sure to be present. Such a water is luckily turbid,

germs in water are diverse. They are: (1) dilution by a large volume of water, (2) sedimentation, whereby the solid impurities gradually settle to the bottom taking with them the subtler particles also, (3) the action of non-pathogenic bacteria, (4) action of sunlight and heat of the ultra-violet rays and (5) the production of bacteriophages which have the power to kill and disintegrate bacteria of disease. It is thus obvious that lake water is a safer source of water supply for human consumption than the flowing river water. Vegetation, fish and other forms of aquatic animals do also help in oxidising organic impurities or devouring them.

Artificial purification. The primary object of purification should therefore be, as we have seen, to remove from the water any traces of pollution (1) that are likely to produce disease; it is also desirable (2) to remove the suspended matter so as to give the water a sparkling and attractive appearance, and (3) to render the water soft if it is hard, so as to make it suitable both for domestic as well as manufacturing purposes. The commonest methods of artificial purification are:—

A. Distillation. This is the best method of purification of water, but in practice it is not economical if it is to be done on a large scale; moreover distilled water is flat to the taste and has an action on metals. It is the method commonly used on naval ships, and the supply of water at Aden is produced in this way.

B. Boiling destroys all sorts of germs even the most resistant of them and removes temporary hardness of water (by driving away CO_2 and precipitating dissolved Ca salts, which we said forms a hard crust inside boilers). The escape of gases from the water during boiling renders it flat also. If boiled water is to be rendered tasteful it should be aerated, as by pouring the water several times from one vessel to another until it froths or through a sieve.

C. Chemical Agents. A hard water is one in which Ca. and Mg. Salts are held in solution as carbonates and sulphates. Hard waters are not suitable for washing as, we said, they form no good lather with soap, and soap is

a thick layer of cloth or through sand and then poured into the filters to be further cleaned. It is, therefore, evident that unless properly cleaned at intervals these filters are not only useless, but positively dangerous, because instead of purifying the water they contaminate it from the residue left behind by water that has previously passed through. If such residue is not got rid of the germs of disease will grow and multiply, and the water passing out of the filter may be infinitely more dangerous than the water that went into.

Charcoal Filters are often used by aerated-water manufacturers in order to obtain clear sparkling water. These filters do not remove the germs of disease from the water. They are, therefore, a source of danger to consumers of such aerated waters. To avoid this danger the charcoal requires to be occasionally cleaned by soaking in potassium permanganate solution for some time.

Test for Germ-free water. The pathogenic or disease producing bacteria contained in water are fewer compared with the non-pathogenic or saprophytic bacteria and are difficult to isolate. Hence the usual method adopted is to detect and isolate organisms like the Bacillus Coli, not usually found in natural water, but always present in excreta, the inference being that if common fæcal bacteria can find their way into any water other pathogenic bacteria will also be present with them.

2. THE SOIL IN RELATION TO DISEASE

The upper few inches of the surface soil contain innumerable number of bacteria and they are very few below the depth of 4 to 6 feet in an undisturbed soil. Their number, however, is considerably larger in a cultivated soil than in the uncultivated or dry and sandy soil. The bacteria found in the soil are of two types. The saprophytic-bacteria, i.e. those concerned with the decomposition and disintegration of organic matter (animal and vegetable) and pathogenic bacteria (or disease-producing germs). The saprophytic are found in greater abundance and are concerned with the final disposal of all organic matter such as animal excreta, sewage, dead bodies, vegetable matter etc. If it were not for their presence in the

of the sun, and it is common experience to find that in no other light than the well diffused white light of the sun can the eyes do as well the usual amount of close work. Particularly is this true of one whose eyesight is below normal. Such a person will often be found able to read fairly comfortably and for several hours in daylight, but will show definite signs of eye-strain even after an hour's close work by artificial light.

Another value of daylight, we have seen, is in its ability—through its U. V. rays—to activate ergosterol in the skin in such a way as to make it act like Vitamin D to enhance the utilisation of Ca and P found in the food, thus preventing or curing rickets and certain forms of "neuroses," like tetany and chorea (St. Vitus' dance) among children. This action is, of course, strongest in bright sunshine, somewhat less strong in ordinary sky-shine and almost entirely lacking in sunlight which has lost most of its U. V. content by being filtered through window glass pane.

The more definite and measurable effects of sunlight upon the human body have been well summarised by Clark, and though the evidence is far from being all in, it is already clear that for the maintenance of optimum health it is essential that we provide in our housing for a reasonable amount of sunlight.

Now, the condition of our houses as a rule provides no outside light for more than a few rooms at the most, and some of our streets are too narrow to admit direct sunlight; and the rows of houses lined side by side as in large cities admitting very little sunshine stand as mute evidence of the fact that our people have not yet been convinced of the importance of sunshine to health; but as we mentioned above, it may be hoped that the popularisation of this knowledge and the removal of the crude notions of sanitation may bring about a reform in our habits of building and living. To ensure sunshine throughout the day in our streets it is advised to build houses facing north and south.

We repeat that though in India we have enough of the life-giving sunlight, our perversity has so ordained

therefore, other equally efficient sanitary methods have to be adopted regarding the disposal of excreta.

The disposal of excreta is not only a sanitary measure but is helpful from the aesthetic stand point also, in that it develops in the community a "Sanitary Consciousness" by which they are tempted to live no longer amidst excreta-smelling surroundings. In fact the aim of sanitation in the disposal of excreta is to convert an offensive putrescible and dangerous material into an inoffensive and innocuous one by methods which are at once cheap, convenient and efficient. This object is accomplished in nature by the action of certain nonpathogenic or saprophytic microbes—the nitrifying micro-organisms normally present both in the excreta and in large numbers in the soil; and on the efficiency with which human excreta and refuse-matter from cowsheds and stables, street sweepings and waste water from houses and factories, slaughter-house refuse etc., are disposed of depends the freedom of a community from disease.

The material welfare of a community can, therefore, be said to be directly dependent on its methods of disposal of excreta, and is a measure of its civilisation.

In villages and municipal towns where there is no water-carriage system arrangements should be made for the removal of excreta from privies by what is known as the "Dry method," the principle to be kept in mind being that no filth, refuse and putrescible matter should be exposed to flies or allowed to contaminate water, but be transported and disposed of in such a manner as not to cause the least possible nuisance to community. Fæcal matter especially when mixed with urine undergoes rapid decomposition in the presence of heat in the tropics and gives rise to foul gases like ammonia, sulphuretted hydrogen and organic vapours.

In villages people generally resort to the garden or some open land for answering calls of nature. This is a very insanitary practice, as during the rains the surface washing might easily flow into tanks and other sources of water supply and contaminate the water with the germs of water-borne diseases; such defects should be overcome by

lanes too narrow to allow free play of air and sunlight. Often they have also in front cattle-sheds and part of this sewage flows into the lanes.

As a natural consequence a considerable amount of overcrowding results within a limited area and goes on increasing year by year as men and cattle practically live together in close proximity.

It must be said in this connection that the village folk are mostly conservative inasmuch as they do not like to go out of their settlement, as they find safety for their cattle and property and for their women-folk within the limited area of the settlement, and they value this security more, for, they have to be away to the fields or places of work for hours together at a time.

Rubbish and manure heaps and animal or even human excreta are in evidence everywhere, as most people go over for calls of nature to the adjacent fields, while some suitable corners and unoccupied places are usually resorted to by women and children. These conditions are very common in every village as the average villager has no sense of sanitation, nor a responsibility to his neighbour, and result from lack of a sufficient number of suitable latrines for the use of the people.

In the rainy weather the nightsoil and sewage mix with the water and are partly absorbed by the land; the surplus flows into the lanes and open-land, or stagnates into pits or low-lying places and become the breeding places for mosquitoes, fleas and other disease-carrying pests, as suitable latrines and safe methods of disposal of sullage do seldom exist.

Any disease-germs that may be contained in such polluted soil may be carried by flies to food and drink, and the filth spread through pigs, fowls and other animals.

Regarding drinking water most of the villages are provided with wells or tanks, but often dirt, refuse, manure-pits and sewage are allowed to collect round about; and it is very likely that the dirty water flowing through them, there being no proper drainage as a rule, may sink into the sub-soil and reach the drinking water. The combined effect of this all is that the villages are

Cleanliness is not merely an aesthetic adornment though doubtless an acquired taste. It is above all a sanitary safeguard, the importance of which has been learnt by hard experience. In other words, to be clean is in a large measure to be safe from infectious disease; and cleanliness applies not only to the person but extends also to the personal environment.

The effects of cleanliness are: (1) There is no doubt that cleanliness of the skin and the mucous membrane of the respiratory tract is an important factor in normal function. The skin by the very nature of its structure and function requires that its surface should be kept free from extraneous material if it is to serve its purposes as a protective, heat-regulating apparatus and as a supplementary excretory organ. The superficial layers of the epidermis are gradually transformed into dead horny scales, which must be removed, or they will interfere with the function of the skin glands. The secretion of sweat glands produces some waste materials that need be removed. During perspiration either on a hot day or on severe muscular exertion there is a tendency for the dissolved solids of the sweat (such as alkaline salts, urea, oxyacids, uric acid etc.) to remain on the skin surface and in the ducts of glands. Their removal is necessary for effective functioning. Sebaceous glands produce in addition to the wastes mentioned above an oily secretion, which acts as a lubricant to the skin and hair. The blocking of the ducts is an important cause in the condition known as "black heads" commonly present on the face of fair people.

Another important factor in retarding the activity of the skin is overclothing with garments which do not properly absorb perspiration or regulate body-heat.

The feeling of wellbeing produced by a satisfactory bath after work involving soiling of the body by dirt or perspiration is well known. This effect is more than a mere mechanical removal of extraneous materials, it means definitely improved functioning of the entire system.

Cleanliness of clothes produces a favourable psychological effect upon the average individual, and even the

the general advice given is that every normal individual should take regular exercise, vigorous and general enough to involve the use of the large muscles of the trunk and limbs, and pursued far enough to induce perspiration and stimulate circulation and respiration.

The force of the heart is spent largely in pumping the blood through the small arteries and capillaries, of which latter there are as many as 20,000 in a cubic millimetre of flesh, a piece that is the size of rather a large pinhead. To maintain the flow of blood from the capillaries into the veins little pressure is required; and the circulatory conditions are so arranged throughout the body that every change of posture and every movement of the muscles sends blood from the capillaries into the veins past the valves set in the veins for this purpose towards the heart. For example, if the fist is forcibly closed the skin blanches as the capillaries are squeezed empty, but the veins of the forearm are seen to fill; so also the skin pales under the influence of gravity when the hand is raised above the head. These facts illustrate the influence of activity and change of posture on the circulation of blood.

Exercise compels increased depth and rate of respiration and the result is more effective oxygenation of the blood, increased elimination of CO_2 and increased O supply to the tissues. By deep breathing the blood is well oxygenated. The respiratory movements and particularly those of the diaphragm act on the abdominal circulation, and when respiration is deepened by exercise a far more active circulation is maintained in all the organs of the body including the bowels, which are thus massaged as it were and constipation is thereby prevented.

Vigorous exercise increases the circulation through a particular part or through the entire body. This circulatory activity carries nutritive material to the tissues and removes from them the waste products of the body-metabolism; it assures the adequate distribution of the endocrine secretions and equalises water and heat-content of the body. This action helps to prevent and remove aches and pain from the body. In case of asthma training of the patient in deep breathing-exercises is most beneficial

out delay. Certainly medical inspection cannot be of any value if the school authorities should rest content with the feeling that with the conduct of the medical inspection their responsibility ceased.

Now, medical inspection must be conducted even from the Elementary Standards, and all students' defects noted and rectified. This helps a good deal in the timely detection of several preventable and easily curable diseases in their early stage. Numerous cases of infectious and communicable diseases like measles, small-pox, diphtheria and whooping cough, which have a tendency to spread like wild fire among the tender and delicate tissues of the young, have been in time detected and prevented from spreading to the healthy.

Mere inspection will not do. The cases should be "followed" up to find out if the defects have been corrected. This is very important if medical inspection is to be of any use at all. The "following" up, however, can best be done by the school teacher himself in the absence of any social organisation in the place.

The importance of all children attending school being given a midday meal whether brought from their homes or provided at the school, was emphasised by the Central Advisory Board of Health, which concluded its sittings in Calcutta on 28th January 1942. The Board discussed the report of the Joint Committee appointed by it and the Central Advisory Board of Education, on the Medical Inspection of School Children and the teaching of Hygiene in schools. It endorsed the opinion of the Committee that satisfactory arrangements for the medical inspection and treatment of students in schools formed an essential part of an efficient system of Education, and as such steps be taken to ensure that children, both boys and girls, attending school were healthy and were kept healthy. The Board agreed that any scheme of medical inspection without provision for treatment was of little or no use; while, in addition, any scheme of treatment should include the provision of supplementary nourishment for undernourished children.

The Board observes that if the physical welfare of the children is to be ensured, there are other requisites besides,

we see it is actually being used in the present war as a weapon of destruction; for example, at various times during recent years Germany has subjected all Europe to a war of nerves and to-day night raids over London are organised by Hitler to keep Londoners awake in an endeavour to lower their efficiency and break down their morale. While London, thus, offers an extreme example of mass wakefulness and its consequences, the physician is interested in securing sleep to his sleepless patient; for the intensity of activity of modern times and the fluctuation of standards have taxed the resources of the nervous system to such an extent that sleep is the only physiological recuperation and is the only means of maintaining physiological integrity. Man can be said to be working and playing too rapidly, in fact he has become a creature of extremes. He cannot afford to burn the candle at both ends even in his legitimate pursuits without deleterious results. Various mental and physical taxations imposed by the driving of automobiles and aeroplanes, the hasty ingestion of meals, the mental worry, the imposition of inordinate social obligations—all require for their neutralisation sound refreshing sleep.

Causes of sleeplessness—Apart from pain or disease sleeplessness can be traced to several causes: worry over business conditions, family troubles, loss of relatives near and dear, love affairs, loss of sexual power, etc. The patient really wants to sleep in order to forget his troubles. But he cannot; his brain is overactive and through his mind flash all kinds of unconnected strange ideas, usually of a frightful and depressing nature.

Means of Induction of Sleep.—The following advice is offered in all cases of insomnia.

Do not retire to bed until physically tired. Avoid sleeping late in the morning; in other words leave the bed at a regular hour regardless of any fatigue that may persist. Avoid the afternoon nap. Leave your worries with your work. Go to bed to relax, rest and sleep. Do no meditative or deliberate thinking after retiring. If there are problems to be thought through sit up until the task is finished. Above all, do not indulge in thoughts of

quality possessed by wool, and silk resembles wool in this respect.

Texture of materials from which clothing is made is a determining factor in its usefulness for heat regulation. Those materials that are poor conductors of heat contain much air in their meshes. Dry air is a good conductor of heat, wool is a poor conductor particularly when loosely woven and is consequently warm. Silk and cotton may be woven so as to be much warmer than usual. Khadder* is a loosely woven fabric of either cotton or wool and is therefore a bad conductor of heat and keeps the body warm. It is cheap, durable and most fashionable as is the fashion of the day in our Country and combines the three qualities in one.

Clothing should not be too heavy, thickness does not necessarily mean warmth. The air-content and texture are of more import. Several layers of light garments of proper quality are superior to a single heavy one.

Dark coloured fabrics absorb more rays of heat and are useful in the cold weather; while in the hot weather and hot countries light colour fabrics are useful.

The way clothing fits should be guided by its relationship to body function rather than style. Clothing should not hamper breathing. It does not suffice to breathe pure air, it must be properly breathed. The abdominal organs with their important functions must not be cramped or their circulation impeded by tight clothing.

The system of wearing a tight belt or girdle round the waist among our women is a common cause of indigestion and constipation and displacement of pelvic organs in the same way as tight-lacing had been in the Victorian days in England.

Body posture has much to do with adequate physiological function. Styles of dressing having a tendency to bring about "poor posture" through their weight and pressure should be avoided, as "poor posture" means inadequate functioning of all the important systems of the body. Constrictions and pressure may be caused by belts, vests, corsets and garters. Improperly fitting shoes or

* Khadder is really Indian home-spun.

population in the shape of provident marriage is, therefore, a wise and efficient means of guarding against misery and death.

Generally speaking the prolific early-marrying race is likely to be less provident, less vigorous, less wealthy and therefore much more easily affected by the "misery check" than the later-marrying race, who adopt voluntary prudential check. The same rule holds good in individual families.

Intermarriage of blood-relations. (Consanguinity of marriage) is often objectionable, because the children born of such parents have a double (one from the mother's and the other from father's side) chance of inheriting any family weakness or disease that may have existed among their ancestors. A neurotic temperament or a tendency to bodily or mental disease is thus more surely inherited. Cretinism is said to be favoured in this manner and the risk of certain hereditary forms of paralysis, congenital deaf-mutism, retinitis pigmentosa with night blindness, epilepsy, insanity and still-births is said to be furthered. Further intermarriage within the narrow circle of blood-relations is a fruitful cause of social degeneration and decay. It is said that the East End Londoners who intermarry among themselves, all practically members of the same family, do not see the 4th generation. They die out without leaving any issue unless they go out and marry from the country and thus bring fresh blood into the family-stock.

On the other hand, if the family be a vigorous one and a healthy one the intermarriage of relations may increase desirable traits in the offspring. This principle is well-known to horse and cattle breeders and to dog owners.

Who should not marry and why? There are certain well defined conditions under which it is objectionable to marry:

(1) when the married state and its contingencies would jeopardise the health and perhaps the life of the person, as in cases of grave disease of the heart, of the lungs or of the kidneys, and of greatly contracted pelvis. In such cases death might be the consequence of the

a subject by itself and does not concern us more in this connection.

Now, however gloomy the above picture be there is Science, which has been growing steadily with the advancement of civilisation, there is Religion, the outcome of an age-long experience, there is the code of Ethics with its "do"s and "dont"s, there is Commonsense, which all human beings are expected to have (but which unfortunately is most uncommon in the world) and above all, the efforts of Hygienists—all these come to man's rescue and lead him to a new realisation, that of a "happier life."

10. LIQOUR HABIT

Alcohol is esteemed mainly for its effects on the Central Nervous System; for, in suitable doses it "relaxes the rigid self-control and discrimination which inhibit the full enjoyment of congenial company."

Alcohol does not require digestion, and being soluble in water and readily diffusible is rapidly absorbed into the system. Infact, absorption of alcohol begins in the stomach itself; this is the peculiar feature of alcohol as no other food-elements are *absorbed* from the stomach; it then enters the blood and diffuses through the tissues and organs such as the Brain, Liver, Kidneys etc., and even after a moderate dose the drug can be detected in the sweat, breath and urine and in the case of suckling mothers in the breast-milk.

No sooner absorbed than it is quickly oxidised like fats and carbohydrates yielding heat, CO_2 and water. In this sense it is often called a "food"; but it cannot be transformed in the system into fat or glycogen as other food elements like sugars or starches can be, and hence it cannot be stored in the body. Moreover, unlike "food" proper, alcohol is "toxic" or poisonous to the cell-protoplasm. Thus, it has been found by experiments that 1 part of alcohol in 100 parts of water killed cress seeds, while 1 in 10,000 solution (equivalent to one drop in one pint of water) retarded their germination. Even the yeast plant itself which produces alcohol is killed by its own product after the strength of alcohol has reached beyond 12 p.c.

Alcohol does not prevent malaria unless the blood-concentration of the drug has reached the point of saturation at which stage "no self-respecting mosquito will come to bite such an individual."

Overindulgence in alcohol saps the vitality of the individual, especially the white residents of the Tropics and predisposes them to diseases like Dysentery, Pneumonia, Tropical liver-abscess, heatstroke or heat apoplexy and Tropical neurasthenia, and lessens also their chances of recovery from these affections; and confirmed alcoholics form very bad subjects for surgical operations, worse perhaps than even diabetics.

Obesity, diabetes and other metabolic disorders like gout etc., can also be traced to excessive and prolonged use of alcohol.

Mortality-records of Insurance companies furnish information for determining the effects of alcohol upon the resistance of the body against disease, and it is seen that nearly 42 to 45 p.c. of applicants are rejected for causes connected with the use of alcohol; and regarding actual deaths, it is seen, that as much as 95 p.c. of drinkers died before the stipulated time, whereas among non-drinkers the death rate was only 70 p.c. This is clear proof, then, that the use of alcohol shortens man's span of life.

Longevity can therefore be said to depend upon the Live—r.

The intimate relation that exists between drink and sexual excesses has long been recognised, and that sexual excesses are a fruitful cause of the increased prevalence of venereal disease in a community. We have already seen that excesses of any sort are distinctly a drain on the human vitality, and it is common knowledge what havoc does venereal disease work on a nation and their progeny.

The effect of alcohol on the Central Nervous System is to successively weaken and suspend the hierarchy of the Brain and therefore of the mind, in the order from above downwards, the most developed functions becoming affected first, especially the finer movements of the hand; next the higher mental powers, such as judgment, self-control and self-criticism are affected.

rice-beer, while the American Indians made their beer from maize or cassava. Wine seems to be much less ancient and the portraits of vineyards and presses may be seen in old Egyptian paintings and pottery. Yet wine-making as at present is still the same art as it was in the days of early history.

There can be no question that the Ancients had known of the hilarious effects of intoxicating drinks and they regarded them as "a means of drowning cares and stimulating dullness into wild joy divinely bestowed upon man." They drank them solemnly in their religious feasts and offered to their gods also. Thus, we read of Indra, the Heaven-God of the Hindus, reeling drunk with the libations of the sacred Soma-juice offered by his devotees, and in later periods of the Greeks singing in bacchanal processions the praises of Dionysos, who made the whole world happy by his "care-dispelling" juice of the grapes.

The juice of the Soma-plant was a favourite drink of the early Aryan settlers of India many centuries before the Christian Era.

What exactly was the Soma-plant is not known, though a number of plants such as Cannabis Indica, Ephedra Vulgaris, Asclepias acida have been suggested by Chopra.

But even at such early days there seems to have arisen an opposite doctrine, and the guardians of religion sensible to the evils of intoxicants proclaimed not only that excess in them was unworthy and hateful, but even the mere tasting of them was a sin. The Brahmins, although the libations of the sacred Soma still remains a tradition among the Hindu religious rites, pronounce drinking of liqour or habitual use of any intoxicants as one of the Five Great Sins (Pancha maha patakani). Even in the old rival religion of Buddhism one of the precepts or commandments that the new adept promises to obey is that forbidding the use of intoxicants of all sorts. The religion of Mahammad, though in a large measure the outcome of the religions of the Jews and Xians, cast off the ancient sacredness of wine and forbade its use as an "abomination" (*Haraam*). In fact, there is no religion which permits the use of intoxicant drinks or drugs.

The alcoholic content of the majority of the country-beers used in India like Toddy, pachwai, and zu (a drink used by the Nagas of the Assam Hills) is low (not exceeding 10 p.c. of Absolute alcohol), but their nutritive and vitaminous value is very high, so much so it has been proved beyond doubt that the parts of India where such drinks are in common use are remarkably free from Deficiency Diseases. We shall see later that yeast or toddy is usually adopted in the treatment of Beri-beri and cirrhosis of the Liver.

Distilled country-liqours and foreign liqours are used only by the richer classes but to a lesser extent. Their alcoholic percentage is rather high. Thus:

Rum, Whisky and Brandy and Gin contain 40 to 45 p.c. alcohol.

Port, Sherry, Madeira contain 18 to 22 p.c. alcohol.

Burgundy, Champagne, Claret contain 10 to 14 p.c. alcohol.

Beer, Stout, Porter contain 5 to 7 p.c. alcohol.

Wines (variable) contain 5 to 20 p.c. alcohol.

11. TOBACCO HABIT

This weed is originally a native of America but is at present grown extensively in India and elsewhere. The name Tobacco seems to have been derived from the inhaling apparatus of the Caribbes, called "tobaco". Tobacco had been in use among the Aborigines and was introduced into Europe soon after the discovery of the New Continent by Columbus at the beginning of the 16th Century; but there are ample proofs to show that the Chinese had known about tobacco and its properties even about the 13th Century, that is, long before Columbus or his America.

Sir John Hawkins it is, that is said to have introduced tobacco for the first time into England from Florida, but some say it is the great Sir Walter Raleigh. Whether it is Hawkins or Raleigh neither of them deserves any credit in this respect, as the use of the drug soon spread to the Continent and the East until today the whole of the civilised world has fallen a victim to its

both lived to a ripe old age and possessed active minds and considerable vigour of body almost to the end.

Amongst the more modern men of prominence such as Lord Roberts, Lord Balfour and Marquis of Landsdowne in England, Roosevelt and his illustrious predecessors in America are all non-smokers. Benjamin Franklin was another American who never smoked. The two "Ironmen" of the present age, Mussolini and Hitler, both of superb physique and both carrying enormous loads these days have never smoked. They are, moreover, exclusively vegetarians, never touched alcohol and never drank tea or coffee; their vitality is amazing and their energy unbounded.

The great General Grant was an inveterate smoker and died of cancer of cheek; Emperor Frederick of Germany, father of the great Kaiser is said to have contracted through excessive smoking the throat affection which finally cut him off in the very prime of life.

On the other side of the picture may, however, be mentioned Carlyle and Ruskin, both literary giants; they were inveterate smokers and regretted their inability to shake off the enslaving habit.

History abounds in instances of great men who would have perhaps shone brighter had they not fallen an early prey to this vice, so much so it is said of them *"They were great not because of tobacco but in spite of it."*

TOBACCO CHEWING

This habit is common only in India and the East, and the dried leaf is generally chewed either alone or more commonly with betel leaves and arecanut with chunam. The presence of the alkali (of the chunam) seems to oxidise the nicotine and favours its absorption in the mouth itself. The effects of the absorption of nicotine on the system are practically the same as we have discussed already in whatever manner the drug is introduced into the system; even half ounce of a strong infusion of tobacco leaves injected into the rectum might produce alarming depression and even death.

The susceptibility to cancer of the mouth in tobacco-

age of 2 or three years, when it need not depend upon the mother for its food. Such drugging affects the children's health and stunts them in body and mind, and they are more liable to catch infection, the mortality among them being comparatively high; but death by overdose is rare.

"Post" or unlanced capsules of poppy are known to have been used for their soporific (sleep producing or quieting) properties in ancient Egypt and Turkey, and by the Greeks and Romans and the Chinese, and employed in medicine. Opium is still cultivated extensively in Smyrna and Constantinople. During the Mogul period beverages prepared from the poppy capsules were extensively used for their euphoric effects and are still in use in some parts of the Punjab and Rajputana. Chopra concludes that the habitual use of poppy heads produces physical, mental and moral degeneration in the habitue in a more pronounced degree than in those using opium.

The chief narcotic principle of opium is the alkaloid morphine or (morphia). Habitual use of morphine has of late spread to India from the Western countries. The opium alkaloids (morphine, codeine, heroin etc.) were at first taken almost exclusively by the mouth but recently their injection has come into vogue. Habit of taking morphine by injection produces a state of chronic morphine-poisoning (morphinism) which "detrimentally affects all tissues of the body particularly the nervous system." In morphine habitues the physical, mental and moral degeneration do set in much more rapidly than in opium addicts. Addiction to other alkaloids of opium, *viz.*, codeine and heroin, is rare in India.

Opium and its alkaloid, morphine are used to lessen pain and procure sleep in all conditions of pain and disturbing influences like cough, dyspnoea, and surpass all other drugs in this respect; but the relief of symptoms obtained from them is only temporary, and persistent use of the drug may do definite harm by masking the symptoms and obscuring the diagnosis of disease. The danger of habit-formation should also be borne in mind and it is in cases of neurotic individuals and in chronic disease that prolonged use of the drug leads to addiction.

teristic energies and the capacity for friendly co-operation with others of similar interests and activities. There are two approaches to the attainment of mental stability; the most constructive of these two relates to the training of children in order that proper habits of action, thought and feeling may be inculcated in them during their period of growth and development. The second approach is to teach adults—Re-education of adults—such principles of mental hygiene as will enable them to make a more satisfactory adjustment than they have heretofore been able to accomplish.

Now, most cases of mental affections that consult the physician are of the nature of functional derangements or "neuroses," characterised by mental depression. Such people are advised to follow an individually planned programme of activity which keeps them busy major part of the day, provides sufficient exercise, a period of rest in the middle of the day, enough sleep at night, and some recreation. Often this treatment can be carried on in one's own home, but if circumstances necessitate a change to another environment it is important to see that the individual is provided with some form of occupational work to keep him engaged.

Neurotic individuals are frequently relieved by the opportunity of relating their history and difficulties to the sympathetic physician or sympathetic friends or relations, and are often amenable to treatment by "suggestion"—such as assuring them that they are organically well and that their difficulties are only functional in type.

The factors concerned with the production of neurosis are mainly:

(1) *Mental Fatigue*—Physical fatigue or hard physical work seldom, if ever, causes nervous disorders, in fact it often acts as an antidote and prevents the occurrence of such disturbances. It is the emotional wear and tear which accompanies the individual's occupation that leads to a sense of fatigue and leads him to the belief that his illness is due to overwork. Such a person should understand that work in itself is never a cause of illness, though

off and must, therefore, be tolerated; fear has to be dealt with by first recognising it and comprehending its nature, and then reacting to the facts of the situation rather than to the emotion.

The sexual instinct is an exceedingly powerful urge in the lives of practically all human beings. In some, however, it is more strongly developed than in others and in such individuals it is therefore, more difficult to deal with. Psychiatrists believe that the sexual instinct is the basis of most maladjustments in the world and that all nervous disorders are directly traceable to the psycho-sexual life of the individual. It is, therefore, important that human beings acquire a rational attitude towards such sexual problems as masturbation, menstruation, sexual intercourse, pregnancy and the menopause.

Pugnacity or the instinct to fight is, when developed to a too great extent, a frequent cause of maladjustment. Overbearing, demanding, contentious and irritable people are difficult to live with, as they not only cause trouble for others with whom they are associated, but are in themselves decidedly uncomfortable as the result of their fighting tendencies. Pugnacity is a valuable quality if it be employed constructively rather than destructively.

Sensitiveness. Next to intelligence sensitiveness is the most valuable trait a person can possess, provided it is not badly directed, in which case it may be a most injurious tendency. A sensitive person possesses quicker and finer perception than does the less sensitive, and in virtue of this attribute he is capable of getting in closer touch with his environment; sensitiveness is thus an asset. Sensitive people dislike criticism and it is necessary for them to understand their dislike of criticism and to make up their minds that there is no way in which any human being can avoid it. Criticism, no one can escape and the sensitive person must largely learn to ignore it.

Environment plays an important part in both the causation and prevention of nervous and mental illness. Each individual enters the world with a certain amount of intellectual, emotional and temperamental equipment; this in turn is influenced by his life-experiences such as

decide to do the job that falls to their lot intelligently gracefully, interestedly and as well as their talents will permit.

Occupation brings one into intimate association with others who are employed along similar lines; and it becomes necessary to adjust to their ideas and to remember that life is eternally a compromise. If one's associates are people who respect their own intelligence, it will be necessary for the individual to modify his personal views in order to work with such associates.

Work is perhaps the best means of keeping mental balance known to man. One who is beset with worries finds, for example, welcome relief in some occupation or hobby that is of special interest to him. Lost in the work or hobby he does, for a time at least, forget his miseries, his worries. Games, sports and music, pictures and other amusements are thus wonderful healers of the disturbances or emotional states of the mind and are the fresh channels for the pleasurable release of mental energy that constantly strives to find an expression. Making models, drawing, writing, garden work or some sort of handicraft of a specially interesting nature to the individual, are similarly some of the commonly accepted aids and means of relieving mental distress or even mental disorder.

Ambition. If ambition acts as an impetus to continued effort it is useful; but if it becomes a dominating drive which causes one to override others, to destroy the good which is in one's own nature, as well as to ignore the opportunities for living a broad life, it is distinctly an injurious tendency. Hence it is a tenet of mental hygiene that 'human beings must socialise their ambitions.'

Frustration is a normal part of life and must be accepted as such. A period of failure is incidental to nearly every enterprise and one should understand that the feeling of failure (even though that sense continue for some time) is not in itself sufficient reason for abandoning an undertaking, but instead, the job must be carried through to a successful termination. If, however, this is impossible the individual must accept

TABLE OF EQUIVALENTS

1 Gramme	=	*15·4 Grains*
1 Kilo-gramme or (1000 grammes)	=	*2 Pounds 3 ounces*
1 Ounce (weight)	=	*28·3 Grammes*
1 Ounce (fluid measure)	=	*28·4 Cubic centimetres*
1 Pint	=	*20 fluid ounces*
1 Tumblerful	=	*10 fluid ounces*
1 Teacupful	=	*4 fluid ounces*
1 Teaspoonful	=	*One fluid dram or* $\frac{1}{8}$ *of an ounce*
1 Desertspoonful	=	*2 Teaspoonfuls*
1 Tablespoonful	=	*2 Desertspoonfuls or* $\frac{1}{2}$ *an ounce*

2 Pints make one Quart

8 Pints ,, ,, Gallon

(2) Fats—Animal fats, fish oils, butter, etc., and vegetable oils.
(3) Carbohydrates—Starch, Dextrine, Cellulose, Sugar, Glycogen etc.
(4) Mineral Salts—Sodium Chloride (Common Salt) Compounds of Calcium, Iron, Iodine, Phosphorus, Potassium, Magnesium etc.
(5) Extractives and Flavouring agents.
(6) Vitamins.
(7) Water.

Now, the three chief functions of food mentioned above are fulfilled by the different food-constituents in different measures:

1. The function of growth and repair of tissues (especially following recovery from wasting illnesses and starvation) is fulfilled by Proteins, mineral matter and water, and practically by these alone. (Now, although for the growth of nervous tissue glucose and lecithin, which consist of carbohydrates and fatty acids, are largely required for rebuilding them, these substances are almost incidental to the structure of the body, which in the main consists of Proteins, mineral salts and water).

2. The second function of food, *viz*., serving as a source of energy and work and production of the body-heat is mainly fulfilled by the fats and carbohydrates; and although it has been recognised by physiologists that proteins also are by their oxidation to some extent capable of producing heat and energy, yet the preferential material for heat and energy-production are the carbohydrates.

Now, this use of food as "fuel" is closely connected with its use as building material, for it has been shown that the former function always takes precedence over the latter function; in other words, the demand for energy is satisfied first, then the demand for growth and repair is met. This is one main reason why, while discussing the adequacy of a dietary we give primary consideration to the value of foodstuff as the source of energy.

Now, the Temperature of the body is maintained at a remarkably constant level throughout life irrespective

This is due to several factors, primarily to their cost and secondarily, to the religious objection of certain sects of Hindus, Buddhists and Jains for animal products like meat, egg and fish, although they have a partiality in this regard for milk alone or its products. Now, milk and its products (curds, butter milk, cheese) may however, form an efficient substitute for eggs and meat, but it has to be supplied in suitable quantity; and if this is done and sufficient supply of leafy vegetables and fruits also be made most of the deficiencies of the rice or wheat diet would be suitably balanced. Physiologically, it has been found that proteins of high biological value like meat, milk and eggs raise the biological value of poorer proteins when mixed with them. This is an important principle, which we shall refer to again while discussing the comparative value of animal and vegetable proteins. Other means of supplementing the chief defects of wheat or rice or millet diets will be referred to under the appropriate headings.

We mentioned above that muscle depends for its growth, repair and activity mainly on proteins and it naturally follows that if proteins are withheld from diet the muscular structure of the body should especially suffer. Prolonged deficiency of proteins in diet, therefore, leads to a general state of muscular undernutrition, poor physique, lack of vigour with decrease in labour efficiency; labourers become fatigued more easily and there is a disinclination for muscular exertion; there is likewise a similar apathetic attitude towards mental work also.

An increased susceptibility to catch cold (from deficient production of heat) is common, reproduction falls off, power of endurance of fatigue wanes, so also the power of resistance to diseases like tuberculosis, leprosy, certain types of anaemia, venereal disease etc.

Now it should be noted that during prolonged fasting also there are likewise a pronounced reduction in heat-production, extreme muscular weakness, mental apathy and a diminution of sexual expression.

To sum up. We have seen that animal proteins are

diet brings about the condition, especially among the rich from overeating and from want of exercise, the other factors helpful in the causation of the disease being sexual abuse and excessive use of alcohol, coffee and tea.

Now, meals containing a large amount of sugar such as sweets, jams, chocolates etc., are not easily digested and are apt to ferment in the stomach and the intestines producing pain, discomfort and flatulence (windiness) with palpitation and even cardiac distress. It has been estimated that nearly 70—80 p.c. of cases of chronic dyspepsia are due to habitual use of sweets. Icecreams often make one "scream" with pain. Even a large quantity of rice or other carbohydrate-food in the diet interferes with the absorption of other elements—such as the proteins, salts and Vitamins—of the food. On the other hand, Vitamins especially Vitamin B_1 and B_2 have been found to be absolutely essential for the proper utilisation of carbohydrate food in general. Carbohydrates and Vitamins are therefore, interdependent on each other for their absorption. Habitual use of too much of carbohydrates in the diet of children is apt to produce Infantile Biliary Cirrhosis of the liver, as children are unable to digest them by reason of absence of certain digestive ferments (Ptyalin of the saliva and amylase of the Pancreatic juice) in them. Often a form of a-vitaminosis manifests itself in children in the shape of certain eye-affections (see later—vitamin-deficiency diseases).

Cellulose is allied to starch and forms, as we said, the ground work of all vegetable fibres; but it is not affected by boiling as starch is, and cellulose does not undergo any change by the action of the digestive-juices of man; and if cellulose undergoes any digestion at all it is due to the action of the putrefactive bacteria normally present in the Coecum (part of the large Intestines) giving rise to certain fatty acids and foul gases, and these acids have an irritant effect on the bowels, thus preventing constipation.

One important use of cellulose in the human economy should, however, be mentioned here: cellulose being prac-

Haemoglobin, the red colouring matter of the blood which acts as the oxygen-carrier to the body. Salts of Na, K and Ca are concerned in the maintenance of alkalinity of the blood and also in the keeping up of the tone of the visceral muscles as of the heart and intestines.

The coagulability of blood is dependent on the presence of Calcium salts in it; Ca also forms with P an important ingredient of bony tissue.

Sodium Chloride furnishes the hydrochloric acid of the gastric juice, and several other salts do contribute towards the alkaline medium in which both the pancreatic and intestinal juices act, and towards the production of bile salts.

Magnesium salts and probably Ca also help in toning down the irritability of nerves, and P is an important constituent of nerve-tissue itself.

P and S are generally contained in almost all kinds of proteins especially that of meat and fish, and of Cereals and Pulses.

Most of the salts of Fe, Ca, P and I are organic in nature, and as such they are much more easily absorbed into the system than the inorganic salts of the same elements. This fact is of significance in the treatment of certain forms of anaemia with Fe salts, that they have to be supplied in these cases preferably in the form of organic compounds of Fe.

Iodine is the active constituent of the Thyroid gland-hormone and is the important element that has to be supplied to the body in cases of Thyroid insufficiency, giving rise to certain diseases such as goitre and myxoedema.

In some limestone districts of England and other countries the locally grown foods and dairy products from cattle and poultry fed on these foods, may not contain sufficient Iodine to provide even the minutest amount of Iodine, and some of the inhabitants develop goitre (Derbyshire neck) which is a form of degenerative swelling of the thyroid gland due to under-activity of the gland substance.

In Switzerland and America the spread of goitre has

efficiency of the white residents of the Tropics to the deficiency of salt in the dietary and consequent depletion of the tissue reserve.

This state though differing in degree is similar to that giving rise to the severe miner's cramps described by Prof. Moss, when the fluid lost by excessive sweating is replaced *only by water*.

Langdon Brown draws attention to another and severe form of this condition commonly met with in the Tropics (and which he calls Hypo-adrenalism) the symptoms of which are similar to those of Addison's Disease (morbus Addisoni), *viz.*, pallor, lassitude and extreme weakness and irregularity of the heart's action, want of appetite (from the digestive juices not being formed in proper amount for want of sodium chloride) and sleeplessness. The condition is due to severe deficiency of common salt in the diet and readily responds to a free supply of it.

These observations show that the large proportion of the effects of torrid climates, which are necessarily most marked among the hand labourers and miners in the Tropics can only be avoided by sufficiently increasing the salt-intake.

An extra ration of salt is reported to have proved beneficial in the maintenance of the general health of troops of the Army in India in the hot weather, and is considered to be useful in the prevention or reduction of heat-stroke and the effects of heat according to the Annual Report on the Health of the Army in India for 1938.

Common salt can therefore, be pronounced to be an absolute necessity for life and cannot be denied to man without grave danger of ill health and incapacity or death. And it is strange that even in civilised countries government consider salt as an article on which an excise duty can be imposed as though it were an article of

* Prof. Haldane of the London University opines that Gandhiji's plea for the abolition of the salt-tax is biochemically justified and that in hot countries salt is a necessity and not a luxury; and he hopes with refreshing candour that "one of the first acts of a self-governing India will be the abolition of the salt tax."

a generous supply, because even if the breasts do secrete this vitamin in their milk it is done at the expense of the mother.

Vitamin A is not easily destroyed by boiling except in the presence of an alkali. Crude Cod Liver Oil, is, therefore, much richer than refined Cod Liver Oil, as evidently most of the vitamins are destroyed during the process of refining probably from very high temperature or admixture with alkalies.

Diseases due to Vitamin A. Deficiency. The chief diseases caused by deficiency of Vitamin A in diet are:

(1) Xerophthalmia (or Xerosis). It is possible also that deficiency in diet in other directions, such as proteins and salts may act as an adjunct cause. In this disease the conjunctiva of the eyeball becomes pigmented or even jaundiced, dried (as the term "Xerosis" means) and lustreless, and appears covered with a material resembling dried foam. In South India the disease is termed 'Karpam' and has been associated with malnutrition and some form of chronic itch. Associated with the disease there is usually *night-blindness* of a functional nature. It is not only on account of the pigmented appearance of the conjunctiva but to the condition of night-blindness also that Xerosis is called *karpam* as mentioned above.

The retina contains a substance called "visual purple' which on exposure to light is converted into another substance "visual yellow." In the dark visual yellow breaks down and visual purple is regenerated. If the supply of Vitamin A is defective the regeneration of the visual purple is retarded. Thus, a person suffering from even a slight shortage of Vitamin A when brought suddenly into the dark from the light takes longer than a normal man to adapt his eyes to darkness, and during the first few minutes of darkness cannot see as clearly as a normal person. Persons with an abnormally low power of adaptation to the dark are said to have night-blindness.

It is thus of practical importance to ensure adequate supplies of Vitamin A for all persons engaged in driving vehicles in the black-out.

fair proportion. Dried fruits like dates and raisins and fresh fruits such as apples, bananas, grape fruits, oranges, pears, plums and ripe tomatoes, beef sheep's liver, mutton, pork and prawns do contain in varying proportions. Milk is not quite devoid of Vitamin B_1, but contains only a trace. Although milk does not contain much of Vitamin B_1 the buttermilk prepared by fermenting milk as is commonly done in Indian households comes to contain it in an appreciable quantity; it is evidently more stabilised by the ferment used.

Vitamin B (B_1 and B_2) is not destroyed by either drying or cooking at ordinary temperatures.

When Vitamin B_1 is omitted from the diet it produces in animals a condition of polyneuritis, in which there is pain and muscular weakness leading to paralysis mainly of the hind limbs and often associated with dropsy and signs of extreme weakness of the Heart. In the human being a similar condition, Beriberi, results from the withholding of Vitamin B_1 from the diet. Now Beriberi is also a form of multiple neuritis and is accompanied generally by dropsy and cardiac disturbances and is most prevalent in places where over-milled rice forms the staple-diet.

Beriberi is very common in the East and has been known to the Chinese and the Japanese for many centuries, and the first Western Physicians who recognised the disease were the Dutch Doctors who encountered it in their early voyages to the Far East. In Japan the disease has long been termed "Kakke" meaning "heavy limbs or weak limbs." One form of Beriberi associated with dropsy is known as "wet beriberi" and was once wrongly named "Epidemic dropsy".

Beriberi is common in Bengal and is endemic in certain parts of the Northern Circars of the Madras Presidency. The author has seen several cases occurring in an epidemic form among the medical students in Vizagapatam in 1910, soon after the soil was disturbed for the construction of a hostel for them, and this corresponded with the onset of the rains also. Evidently the wet-weather and the soil-effluvia lowered the general vitality

bles have a feebler antiscorbutic value. If fresh vegetables cannot be obtained sprouted grains are equally useful and more nutritious. In the siege of Kut in the War of 1914-18 beans were one of the chief foods of both the British and Indian troops. The Indian troops according to their usual customs sprouted the beans and thus obtained sufficient Vitamin C to ward off scurvy. The British troops, on the other hand ate the beans unsprouted and fell victims in large numbers to scurvy, and this was one of the main causes of their final surrender.

Tomato or potato-juice, oranges, apples, bananas are highly useful. It is a very good rule that infants should begin to receive orange juice or tomato-juice in addition to their milk even after the first month of life, whether the milk is derived from the mother or the cow, and no artificial foods are recommended for fear of scurvy in children unless supplemented with enough of fresh fruit-juice or tomato juice; malt is a nice anti-scorbutic and is a fattening food for children.

[Prof. Albert Szent-Gyorgyi, noted biochemist of Francis Joseph University, Szeged, Hungary, was the first to obtain Vitamin C or ascorbutic acid as it is known chemically, in crystalline form. For his discovery of the biological processes of oxidation with special regard to Vitamin C he was awarded the Nobel Prize for 1937.

Only in 1938 he reported the discovery of a new vitamin, christened with the letter P, which is closely related to Vitamin C, and like it is found in lemon and paprika. Paprika is a variety of capsicum (capsicum annuum) grown all over Europe. It contains about 4 to 5 times as much of Vitamin C as lemon.

Dr. K. M. Shenai has been corresponding with Prof. Szent-Gyorgyi regarding his discovery of Vitamin C in cashew fruits, and the Author was shown by him a letter received from the Professor about 20-8-38 in answer to a query from Dr. Shenai as to the nature of paprika.]

Deficiency of Vitamin C in diet has also been known to produce some form of Infantile cataract.

5. *Vitamin D.* (Antirachitic or Rickets-preventing factor). Vitamin D is generally present in association with

II. Food Requirements of Normal Individuals

We saw that the food requirements of an individual are determined by the cell needs of the body for materials of growth, repair and also the production of heat and potential energy. In order that these demands be adequately met the body must be furnished with the necessary quality and necessary quantity of all the essential elements of food above-mentioned, viz., Proteins, Fats, Carbohydrates, mineral salts, Vitamins and Water. Of equal importance is the consideration that these food stuffs be so presented as to be acceptable to the body cells; in other words, they must be such as are easily digested and easily assimilated, that is, more or less completely absorbed into the blood. Now there are many substances like saw-dust, agar and hoof parings for example, which can be analysed into the various food elements and having the physical properties of producing heat, but these are of no use to the system, as they are not only indigestible but cannot be absorbed either, and so they are of no value whatever to the system.

It must be remembered that the satisfaction of the cell demands is conditioned also by other factors than digestibility and assimilability, and that is the relationship of the nervous and mental mechanism, such as emotions, sorrow, excitement—these latter being to a large extent dependent on the action of the endocrine secretions; and it will shortly be seen that the rate and intensity of tissue activities also is influenced by these.

A. THE QUANTITY OF FOOD

As one great Authority aptly said, like all other branches of Science, Medical science is in no way immune to the caprice of Fashion, and specially so is the science of Dietetics; and a good deal of work has been done by scientists from time to time to determine the optimum

been shown any considerable decrease in the normal amount of water in the body interferes with its manifold activities, which are essential to the highest levels of health; moreover the quantity of water lost through the Kidneys, Lungs and the Skin is enormous and should be immediately replaced by water either taken as drink, beverages and soup or that contained in the solid foods. This intake should be specially large in the Tropics for reasons already mentioned. "The taking of 6 or 8 glassfuls of liquid daily will assure a satisfactory water equilibrium if the dietary intake is well-balanced." Lack of sufficient fluid is one of the chief causes of the widespread constipation encountered in Tropical practice.

Water, however, should not be taken in large quantity with meals, as in that case there is a natural tendency to minimise mastication of food in the mouth, which is highly essential for the proper admixture of saliva (insalivation of food) necessary to digest part of the starch of the food into sugar by the action of ptyalin ferment contained in the saliva; large quantity of water dilutes the digestive juices also and hence retards digestion on the whole. There is one important physiological principle to be mentioned in this connection, *viz.*, the time required for the stay of food in the stomach, before it passes on to the duodenum, is greatly reduced by an exceedingly fluid-state of the stomach contents (the chyme), thus very little time is given also for absorption of peptones (the products of digestion of proteins) large part of which may thus be lost to the system.

Water is best taken the first thing in the morning or half to one hour before meals; when the stomach is empty water tends to wash out the mucus or remnants of food or impurities that may be left in the stomach or the bowels. No other drink is needed as a rule and no other ought to be permitted; in fact drinks like coffee or tea are unnecessary stimulants and their chief value lies in the water these drinks contain and their stimulation is "a delusion, a pit-fall and a snare." A free action of the bowels which follows soon after taking coffee or drink in

Fats	9 calories per gramme
Proteins	4 calories per gramme

It is clear from the above that from a purely energy aspect Carbohydrates and Proteins are of equal value and that Fat yields more than twice as much heat as either Carbohydrate or Protein.

Now, nearly all our foodstuffs contain these three elements (Fats, Carbohydrates and Proteins) though in different quantity and proportions; and by analysis it is possible to say how much of each of the ingredients are contained in a particular foodstuff. It is then possible to calculate the actual energy value in calories of that foodstuff.

According to McCarrison one ounce of the best unpolished rice contains:

2·3 grammes of Proteins.
22·3 grammes of Carbohydrates
and 0·085 grammes of Fats.

The total caloric-value, therefore, of one ounce of unpolished rice is obtained as follows:—

Proteins	2·3 grammes	× 4	(Rubner's figure)	= 9·2 Calories
Carbohydrates	22·3 ,,	× 4	,,	= 89·2 ,,
Fats	0·085 ,,	× 9	,,	= ·765 ,,
			Total	99·1 ,,

Hence, the total caloric-value of one ounce of unpolished rice is just over 99 *Calories*. Similarly we find that the energy value of one ounce of milk is about 18 calories, and of one ounce of mutton 42 calories.

C. CALORIC REQUIREMENTS OF ENERGY.

The Reports on the Physiological bases of nutrition drawn up by the Technical Commission of the Health Committee of the League of Nations which met in London in Nov. 1935 was published at Geneva on 6th Dec. 1935. It lays down as follows:

"An adult male or female living an ordinary everyday life in a temperate climate and not engaged in manual work is taken as the basis on which the needs of the other age-groups are reckoned. An allowance of 2400

From the point of view of fact as well as of probability it is apparent that nutritional safety is ensured by "variety" in the selection of food stuffs. In this connection it must be noted that *one unique property of the living organism is that it can adapt itself within a certain range of environmental conditions;* and a change of environment is as is well known "stimulating." Variety may, therefore, be said to be the keynote of Practical Dietetics, it ensures that nothing is left out, it stimulates the palate and it alters the nutritive medium surrounding the cells.

McCarrison gives the following as an example of a well-balanced diet usually employed by certain wheat-eating races of Northern India, and for this reason, he says, "no races of mankind are better developed physically nor more capable of endurance and hard work." It consists of:

12 oz. Atta.
6 oz. Rice (handpounded)
2 oz. Meat (mutton)
20 oz. Milk.
1 oz. Vegetable oil.
1½ oz. Ghee.
8 oz. Root vegetables
8 oz. Cabbage.
4 oz. Mango.
1 oz. Dhal

and represents

Proteins, 95 grms.
Fats, 86 grms.
and Carbohydrates, 435 grms.
(after allowing 10 p.c. for wastage)
and has a fuel value of 2900 calories.

COMMON INDIAN DIETS AND THEIR DEFECTS

(After McCarrison)

1. Suppose the staple article of diet is *wheat* and that this is eaten in the form of *atta*.

(a) The atta provides enough carbohydrates but not enough of fat. The latter must, therefore, be added. The best way to do this is by taking butter, ghee or mutton-fat with the atta, because these animal fats not only

both of which, he says, are examples of Badly-balanced Diets:—

(a) The Poor Hindu Family Diet

Consists of:

	Polished Rice	21·0 oz.
	Dhal	0·7 oz.
	Black gram	0·7 oz.
	Vegetable oil	0·1 oz.
	Vegetables	2 oz.
	Meat or Fish	0·06 oz.
and	Cocoanut	0·05 oz.

This gives after allowing 10 p.c. for waste:

Proteins	42·92 grammes
Fats	7·18 ,,
Carbohydrates	520·20 ,,

and yields 2325 calories.

Now, this diet contains too little Protein, all of which is of vegetable origin, far too little fat, too much Carbohydrate and not enough Calories; it is dangerously low in all the vitamins especially A and B and it is deficient in mineral salts notably of Ca, P and Fe.

The family living on this diet, McCarrison says, were of "low vitality incapable of sustaining hard work and prone to bowel complaints."

(b) The well-to-do Hindu Family Diet

Consisting of:

Polished rice	23·0 ounces
Dhal	1·2 ,,
Gram	1·9 ,,
Vegetable oils	1·2 ,,
Ghee	0·4 ,,
Curds	9·0 ,,
Vegetables	6·0 ,,
Cocoanut	2·0 ,,
Sugar	1·0 ,,
Milk	7·0 ,,

representing after the usual 10% allowance for waste,

Proteins	75·7 grammes
Fats	85·3 ,,
Carbohydrates	643·1 ,,

and yielding 3651 calories.

given below, that the Commission's views and recommendations are in the main in full agreement with the basic principles of knowledge already described in these pages but embodies much more especially regarding the requirements of children and adolescents. Briefly they are:

1. The *protein-intake* should not fall below the prescribed optimum amount and should be derived from a *variety of sources*, and it is desirable that a great part of the proteins should be of animal origin. During growth, pregnancy and lactation some animal protein is essential and in the growing period it should form a large proportion of the total protein.

2. *Fats* must form a constituent of normal diet, and should be allowed in proper quantity, which may have to be increased in cold climates.

3. *Mineral and Vitamin Requirements.* The Commission recognises the fact, as we saw, that deficiencies of modern diets are usually in the protective foods (foods rich in minerals and vitamins) rather than in more strictly energy-bearing foods (foods rich in calories).

Among the *protective* foods are, first and most important, milk and milk products, eggs and glandular tissues; then green leafy vegetables, fruits, fat fish and meat (muscle).

4. Among the energy-bearing foods of little or no protective power are sugar, milled-cereals and certain fats; of energy-giving foods milled cereals are not rich in protective nutrients (vitamins and salts) and the more they are refined the less is their protective power. Many fats, especially when refined possess little or no protective constituents.

Refined sugar is of value only as a source of energy as it is entirely devoid of minerals and vitamins. The increasing habit of large sugar consumption tends to lessen the amount of protective foods in the diet and is to be regarded with concern.

5. *Requirements of Pregnancy and Lactation.* The pregnant and nursing woman should be regarded as a member of the population needing the greatest "protection" in order to ensure an adequate physical endowment for

we noted above; and sometimes mental disturbances like insomnia and tropical neurasthenia result necessitating an early return home.

The question of moderation in eating and drinking goes beyond an occasional banquet or orgy. Ordinarily we all eat more than what we actually need, and some people eat a good deal more. He who over-eats habitually is laying up for himself a number of ills.

There is an established rule of life which bids one rise from the table feeling that he could eat a little more. But there are many who do not rise from the table until they can literally eat no more. Even animals do naturally turn away by unerring instinct from their food when they have eaten enough, unless they mix with human beings, when they stand a chance of being overfed.

It is the middle aged people that are apt to eat too much and at too frequent intervals, because the pleasures of the table, it is said, become then of greater importance as their capacity for other pleasures of life is gradually waning. As we get older the powers of digestion and the powers of elimination become feebler and for that reason alone less food should be taken than in youth and early manhood. After, therefore, the 50th year at any rate the amount of food should be considerably lessened.

The old adage "a man at 40 is either a fool or a physician" should not be taken literally; it means that at that age he is capable of distinguishing between foods that agree with him and those that do not. If he had been greedy and self-indulgent he would then be careful to avoid the same.

Dyspepsia, which makes miserable martyrs of thousands, not to say millions, is directly traceable to over feeding and wrong feeding, to overuse of starchy and sugary foods, excess of coffee, tea or alcohol and excessive use of iced drinks and ice creams; so also constant use of fried foods, especially highly seasoned meats fried in animal fats. Besides dyspepsia many other ills follow over-indulgence in the pleasures of the table. Uric acid, the cause of the agonising and crippling complaints

Tuberculosis is eminently a deficiency disease, says Dr. Muthu—deficiency of fresh air and light, deficiency of proper nourishing food, of sufficient exercise and sufficient rest; and chronic want and poverty are the commonest causes of Tuberculosis among the poor and middle classes in India.

The question of application of the knowledge of nutrition has been neglected by employers in industrial concerns. A greater proportion of the workers are living on diet much below the safety line, the result being that they are easily fatigued and suffer from lassitude and want of application to or interest in work; their mental condition becomes depressed, and the work suffers resulting in great economic loss to the country. Deficient diet is deeply significant in this hour of industrial mobilisation and the efficiency of work is closely linked to the physical condition.

It has been observed in Britain and other war-industrialised countries that the improvement in the diet of the workmen was followed by a greater output of work and that there was a great reduction in the number of accidents.

To-day, as never before, this question of the nutrition of industrial workers demands our greatest attention, because these workers constitute our second-line defence, and because greater amount of activity and work is demanded of them; and today during the national emergency we should awaken ourselves to the fundamental importance of adequate nutrition in maintaining the health of workmen employed in industrial organisation.

As to the problem of nutrition affecting the entire population we have below the recent statement of the Secretary of the Agricultural Department of America. He said: "Food will win the War and write the Peace."

With these two objectives in view the problems of "better national nutrition" and "grow more food" have to be solved. In this connection it must be pointed out that India being mainly an agricultural country should play a great part in ending the present War. She must supply food and material for herself and for other countries as

of the individual with normal nutrition should be regular and hearty. A capricious appetite means a psychic abnormality and is a danger signal.

The need for a proper diet in the treatment of disease has been recognised from the days of the Ayurveda, and the following is from Lolambarajiya (Vaidya Jeevan).

पथ्ये सति गदार्तस्य किमौषधनिषेवणम् ।
पथ्येऽसति गदार्तस्य किमौषधनिषेवणम् ॥

Which means: "When there is proper food for the patient what is the *need* for medicine? When there is no proper food for the patient what is the *use* of medicine?"

gruel, or mixture of milk with some other kind of food such as bread, rice etc., as in making porridge, not only renders the milk itself more easily digestible but the mixture also rendered easily digestible; and we have seen that combination of milk with any other article of food raises the biological value of that food-stuff also.

One property of milk has been found to be its tendency to augment the secretion of the gastric juice in the stomach independently of reflex nervous influences, such as watering of the mouth at the sight or thought of food. This property does by no means obtain in any other food even including 'soups' and marks milk as the most ideal of the invalid foods.

Milk ordinarily causes constipation, but in some it produces diarrhoea, and the addition of a little tea or coffee to milk might overcome this condition.

Milk slowly sipped is more easily digested than swallowed in gulps. Being a fluid milk is easily swallowed; this is a great advantage especially in the case of exhausted patients and the quantity administered may also be measured. Being quite bland it is nonstimulant and is a useful diuretic in cases of gout and dropsy from kidney disease and in some forms of Asthma.

Provided that the milk is *not* contaminated skimmed milk is best used fresh without boiling.

The alkalinity of milk has been availed of in diseases of the stomach, such as ulceration and some forms of dyspepsia, in which there is an increased acidity in the stomach. Moreover the fat contained in milk exerts a restraining influence on the amount of gastric juice also, so that milk can be considered an excellent article of diet in those conditions.

Skimmed milk being more easily digested is particularly useful in the case of invalids and in all conditions of intestinal and liver disorders.

HYGIENE OF MILK AND MILKBORNE DISEASES

We have seen that milk is an article of diet essential for Infants (and many of us for months had no other food); and for sturdy youth it is also helpful, if not quite

survive. But in practice such a suggestion will be of no value, because it is difficult to determine with absolute certainty which animals are free from the disease (tubercle) and which are not. Diseased animals may then be overlooked and these would soon contaminate their mistals, and owing to the viability of the Tubercle bacillus, within a generation the trouble would be as wide spread as ever.

How are we then, to render our milk supply safe for our use? There are a variety of ways of doing this:

(1) The simplest and most obvious is the boiling of milk; this destroys the Tubercle bacillus and other bacteria; but it affects the quality of milk as food not by reducing its nutritive value—in fact, it is on the other hand increased—but by reducing the Ca and P content, by injury to the vitamins and by causing other changes not yet fully understood. These disadvantages are, however, negligible and easy of compensation by the consumers themselves.

(2) Pasteurisation is equally effective. Fig. 2. It consists in heating the milk to a temp. of 142°F. to 150°F.

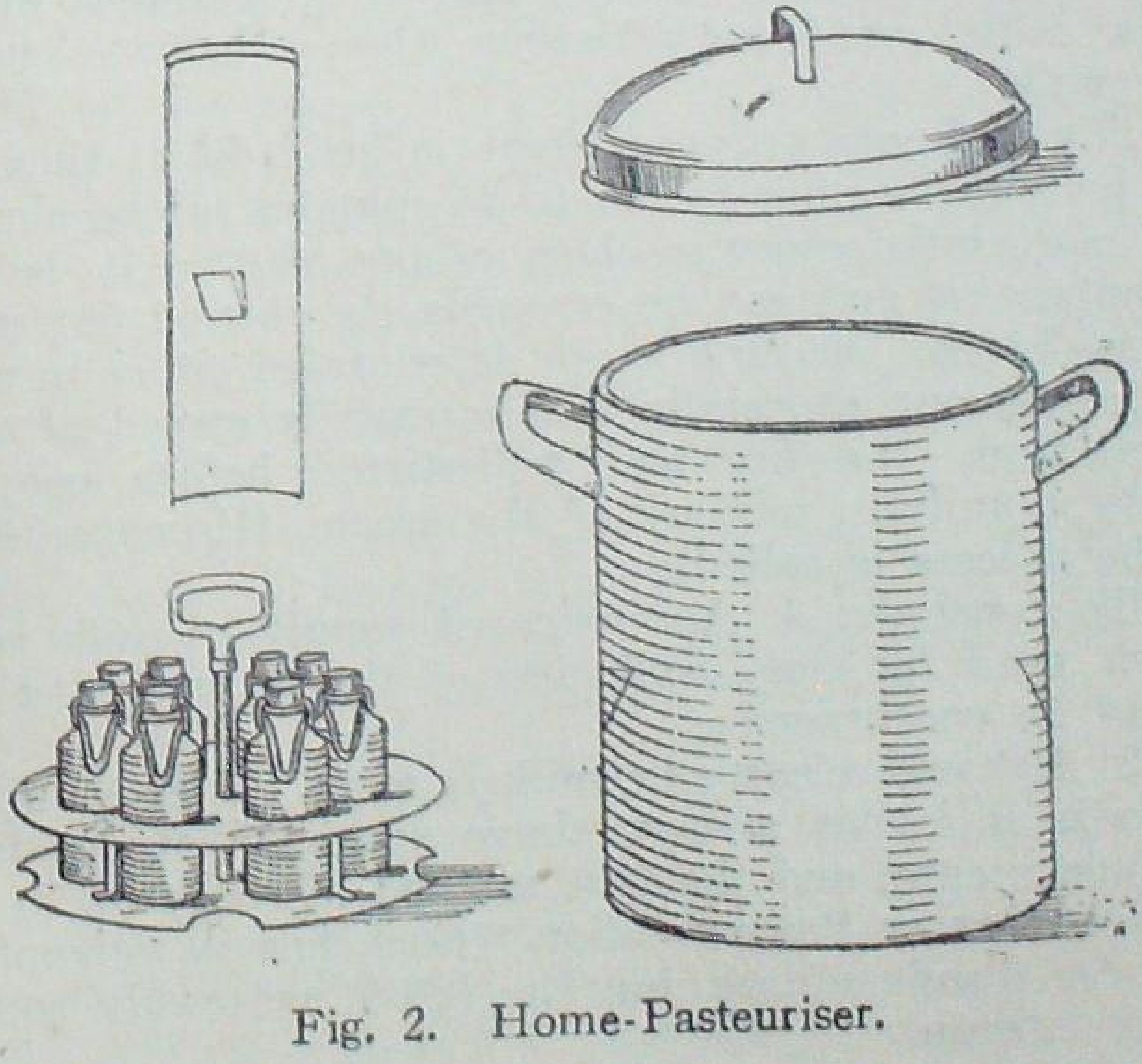

Fig. 2. Home-Pasteuriser.

ment normally present in milk converting the sugar of milk (lactose) into lactic acid. Various ferments are in use. The common ferment used in India to convert milk into curds—Dadhi—is a form of Streptothrix (Streptothrix—dadhi, Chatterji) having characters similar to those of the Bulgarian Bacillus (the ferment of Koumiss).

The milk is first boiled and when cooled it is inoculated with a little sour milk from a previous preparation; fermentation then starts and is complete within 12 hours.

When curds are churned butter separates and can be skimmed off, and butter-milk is left. As butter consists mostly of fat and major part of vitamins, the butter-milk comes to contain very little fat, a certain proportion of vitamins (Vitamin B) and practically all the salts and lactose of the milk, but part of the lactose converted into lactic acid. Butter-milk therefore, resembles skim-milk but is more easily digested owing to the fact that its casein is present in a finely flocculent form. The nutritive value of butter-milk is considerable, an ordinary glassful yielding nearly as much nutriment as 2 oz. of bread. Butter-milk has diuretic properties; this is of great advantage both in health and in many cases of disease; being fat-free it forms a good diet in jaundice, hepatitis and sprue. It forms a refrigerating drink in the Tropics and is commonly resorted to in the hot weather. Butter-milk should always be taken after food or with the last course of the meal.

Butter-milk is a household antidote to ganja, tobacco and arecanut poisoning.

The action of lactic acid on the fermentative (acidophilic) bacteria in the Intestines, especially the Colon Bacillus, is according to Prof. Metchnikoff, a beneficial one, so much so that Bulgarian milk (Koumiss) was once regarded as a panacea for all human-ills and tended towards longevity, and butter-milk came to be used in the dietetic treatment of sprue, colitis, fermentative-diarrhoea, constipation, gout, arteriosclerosis and some forms of skin disease and erysipelas.

MILK AS FOOD

If a man should live on milk alone he may have to

Cheese is cheaper than meat and should evidently be of the greatest value in the poor households. But to the poor man, who chooses his cheese as a cheap and efficient article of diet to replace meat, it is necessary that he should go in for the best and cheapest kind, and such is afforded by the Canadian or the Dutch make, as in doing so he will get the maximum nutrition for minimum cost.

One of the greatest objections, however, to cheese is the most offensive smell it gives rise to on decomposition, humorously likened by Jerome K. Jerome to "the smell of a dead child."

EGGS

Eggs are peculiarly excellent source of proteins, fats and other food elements contained in the white and the yolk, but not carbohydrates; the proteins of both the white and the yolk are quite adequate for growth. Yolk is rich in P, and contains as much Ca as milk and the Fe of yolk is in a particularly valuable form; Vitamin A, B_1, B_2 and D are also contained in good quantity in the yolk, which makes egg an article of diet of exceptional value.

MEAT

Meat is the best source of protein from the amino-acid stand point and is rich in Potassium, P and Fe, but is deficient in Ca; vitamins are deficient in meat (muscle) but are present in good quantity in the glandular tissues like the liver, kidney, etc., which are rich in Vitamin A, B_1 and B_2.

Eggs and meat are important from the dietetic point, as they provide protein of high quality and Fe in an assimilable form, while the Vitamin A and B contained in yolk renders a diet of eggs and meat of particular value in the diet of children.

Meat can be said to be one of the few articles of diet on which life can be sustained for an indefinite time. This does not mean that meat by itself constitutes a perfect food, because, we have seen, it is relatively much too rich in protein and too poor in respect of Carbohydrates, fats, salts and vitamins. It would require about 6 to 8 lbs. of meat a day to supply the energy required. Such a quan-

Potash, and is given to cattle, pigs and poultry to improve their tone.

Seers (*Mal: Aikola; Tulu: Anjal; Kon: Visan*) and Pomfrets (*Mal: Akoli; Kon: and Tulu: Manji*) form two chief sorts of table fish; also Cat-fish (*Mal: Eta; Kon: Sangali*), Shark (*Mal: Srava, Kon: Moari*), Solefish (*Mal: Mandal; Tulu: Nang*), Shellfish (*Mal: Kolu; Kon: Kubbe*), Oysters (*Mal: Poondal; Neeli in Kon)* and Prawns, *Chemmin* (*Mal.*); *Sungat* (*Kon.*) are also common.

Other varieties of Edible Fish, introduced in Madras by the Fisheries Department, are:

1. Catla Fish, originally a native of the Krishna river, is a freshwater fish and is hard, Catla fingerlings standing transport very well.

2. Gowrami, a native of Java and Mauritius, is a large-sized fish growing to about 5 feet long and 70 lbs. in weight, boneless and of delicate flavour; can be easily reared in fresh water ponds and is a vegetable feeder.

3. Entroplus Suratensis—is also well adapted for pond culture, palatable and boneless and is esteemed a delicacy. It does not grow bigger than a foot and a half.

Larvicidal Fish, commonly known as "millions" are eaten only by the poorer classes and are helpful in the destruction of mosquito larvae thereby preventing malaria and elephantiasis and yellow fever.

From experiments carried out by the Madras Fisheries Department the following species of fish have been found to be most valuable as larvicides, feeding on the larvae of the mosquitoes in stagnant fresh-water-ponds and wells.

Haplochilus	—Mandakini	(Tamil);	Sukkachappa	(Tel.).
Panchax lineatus	—Paravai	do.	Keethakai	do.
Chela	—Velliche kendai	do.	Bedisa	do.
Barbus	—Kendai	do.	Parogi	do.

In order that they may yield the best results they should be introduced only in tanks free from larger fish of predatory habits (of devouring on smaller fish) such as Murrel (*Koru meenu: Kon: Maggani; Varal*) and Wallago (*Vala meenu, Kon: Karli; Valuga*).

of grains which are mutually supplementary as regards their amino-acids. We have seen already how the deficiencies of wheat, rice and ragi diets have to be made up by the addition of milk, eggs, meat and dhal. 3. Highly milled cereals such as wheat or rice are very deficient in Vitamin B_2 and salts of Ca, P and Fe; and perhaps Vitamin B_2 is the only vitamin contained in the pericarp and germ of the cereals, which are lost in milling; cereals contain no other vitamins but when they germinate their sprouts are a potent source of Vitamin C.

RICE *(Oryza sativa)*

Rice is the most important cereal crop and is extensively grown in the Tropical and subtropical countries, where there is sufficient water supply also; the acreage of rice cultivation in India is very vast being over a hundred millions.

Rice as harvested is known as paddy, in which the rice grain is enclosed in a tough husk; the husk is non-edible and indigestible being made up of cellulose and silica; and has to be removed before the rice could be used as food. As paddy the grains are well protected against external influences like moisture, weevils etc., and if the paddy is stored in a dry place it can be kept for an indefinite time without deterioration; but even as paddy it is necessary to observe proper precautions against damage by the damp weather.

The removal of husk is essential and is done either by hand-pounding or milling; in either process a part or all of the outer tough layer of the rice grain (silver skin) is removed with the husk. This outer layer called the bran, that is separated contains the germ or the embryo of the rice also, a larger proportion of proteins, fat and P, Ca, Fe salts, and Vitamin B_1 than the inner layer of the grain, (the grain proper) which is mostly (77 p.c.) starch; so that if the process of milling is carried to excess the rice loses a greater part of its nutritive properties. Over milled polished rice loses in this way a much larger part of its nutrition than hand-pounded rice.

The bran is edible and is rich in proteins, fats, mine-

to raise pulses also in the same farm. Pulses will thus be an additional source of protein in the villagers' diet; and with a few vegetables grown on the field margins these poor people will have at their command sufficient nutritious food, if only they have the means to meet all their needs, out of what they produce. Unfortunately they strain every nerve to sell away almost all they produce. It is well-known that villagers who feed on millets and pulses are much better in their health and physique than the rice-eaters.

Hence millet growing may be supposed to be a very economical and self-supporting form of agriculture; and here is an opportunity to rural welfare workers to do sustained propaganda work towards consumption of more millets and give an impetus to their cultivation.

BAJRA OR CAMBU *(Penniseteum typhoideum)*

Also known as Bulrush millet; is cultivated as a rainy season crop in N. W. F. Provinces, Bihar, Bombay and South India; is the staple food of the poorer. It is supposed to be heating, hence used mostly in winter. Unhusked grains contain Protein 12 p.c.; Fat 5 p·c.; Carbohydrates 70 p.c., salts of Fe, Ca and P and Vitamin A and B_1.

BARLEY *(Hordeolum sativae or H. vulgare)*

The Six Sided variety is usually grown in India, in the N. W. F., the Punjab, Ajmir, Merwara and Bombay. As prepared for food in India Barley is considered rather difficult to digest. Contains roughly, Proteins 10 p.c., Carbohydrates 60 p.c., Fat 2·0 p.c., moderate amount of minerals and Vitamin A (trace) and Vitamin B (moderately). Barley occupies the place of pride among the cereals as raw material *par excellence* for malting both in the brewing and the food industries.

CHOLAM *(Sorgham vulgare) Jonna, Kaffir-corn.*

Extensively cultivated as hot weather crop, common food of labouring classes, easily digestible, less wholesome than maize. Contains Protein 11 p.c., Carbohydrates 74 p.c.,

As this process causes bread to become sour it is now given up and the next advance on this process which might have been introduced after brewing of Beer became known, was to use pure Brewer's yeast. This produced good bread without the sour taste. Several modifications have, however, of late been made, all with the idea of producing sponginess of the loaf. Good bread should be white in colour and light and spongy; a yellow colour or an acrid taste indicates old flour or bad yeast; a heavy bread is indicative of insufficient baking or bad yeast and is indigestible.

Beemax—an artificial form of Food—is prepared from the embryos of cereals and is said to be rich in Vitamin A, B and E and is rich in Proteins, Phosphorus and contains 43 p.c. of Carbohydrates.

B. PULSES

Pulses are seeds of leguminous plants and include peas, beans, grams and lentils. The chief chemical characteristics of this group are their richness in Nitrogen. There is a special provision made by Nature for the adequate supply of N to leguminous plants in general in the form of little nodules on their roots, these nodules consist of bacteria which have the power of fixing the free N of the air and passing it on to the use of the plant.

Most of the Nitrogen present is in the form of protein, and in virtue of this fact pulses have been described as the "poor man's beef," and for this reason black gram is probably named "masha" in Sanskrit.

1. The chief protein food in the pulses is "legumin," sometimes spoken of as the vegetable casein, owing to its resemblance to the chief protein (casein) of milk; so much so that a kind of cheese is being prepared from beans.

Pulses do not readily soften if the water in which they are soaked is *hard*, i.e., if it contains much of lime. The addition of Bicarbonate of soda to the water, however, throws down the lime and a brief soaking in water thus treated enables the pulses to be soaked sooner and baked more readily; the alkali also removes part of the

rich in proteins and fat and may be used roasted as a diabetic food. It contains 26·72 p.c. proteins, 40·13 p.c. fat, 21·0 Carbohydrates and Vitamin A, B_1 and B_2. Groundnut on expression yields a bland edible oil, which is also used for industrial purposes and for production of soap. Groundnut cake forms excellent food for cattle and rich manure for plants.

A patent food—Nutrose—is mostly groundnut deprived of part of its oil.

BEANS

There are several varieties of these which are used as food.

1. The French kidney bean, or pink bean (Phaseolus vulgaris)—The tender pods with the seeds or the seeds alone are consumed, either green or dry, of course stewed. The amount of cellulose present in the pods causes it to be digested and absorbed with difficulty and on that account it is a wasteful form of food.

2. Allied to the French bean are the scarlet runner beans (Phaseolus multiflorus) which are used stewed.

3. The Broad Windsor beans, or Double beans (Faba vulgaris) are eaten either in the green or dry state.

Beans are, on the whole, richer in protein than peas but contain also more sulphur and are more apt to cause flatulence.

All beans contain Vitamin C, and cluster-beans (cyamopsis psoralioides) contain Vitamin A also; while French beans contain Vitamin A and B_1 also.

4. The Indian mitki (*Kottavaranga*) (cyamopsis Tetragonoloba) is also a variety of beans, the entire pod with the seeds only being used cooked. The pods are very indigestible from the presence of a large amount of fibre and starch; that is the reason why it does not agree with many being said to cause biliousness.

5. Sword-beans (Canavalia ensiformis)—*Val-avaranga—Tammattangai*—are large variety of beans. The seeds and the pods are sweet and mealy when cooked. They are heavy bearers and easily cultivated, and are extensively grown in jail and asylum gardens in South India.

position, but contains much more Vitamin A and is more deficient in Vitamin B, than potato.

COMMON YAM *(Typhonium trilobatum)*

Is the tuber of a tropical climbing plant, is much larger than the potato but similar to it in taste and chemical composition, but the vitaminous value of ordinary yam is much less than that of either the elephant yam or even the potato.

The nutritive value of yams is the same as of the potato, but some of them have an alkaline principle, which causes irritation or itching of the mouth and skin in the raw state and some of them even on cooking. This principle can be neutralised by the addition during cooking of any acid stuff, such as tamarind, green mango, limes, Chinese gooseberries, hogplums *(ambadaikai)*, Karambola and Indian sorrel *(gonghur, Pulichankeerai)*.

KURUKKOO *(Coleus parviflorus)*

One variety of edible tubers allied to potatoes extensively cultivated on the west coast is the Kurukkoo (coleus parviflorus). The cooked tubers have an aromatic flavour, are sweetish in taste and excite the flow of saliva; on this account they are perhaps as easily digested and as completely absorbed as the potato. They do not give rise to flatulence and are good diuretics.

TURNIPS *(Brassica rapa)*

Consists of 90·3 p.c. water, that is, much more than what is contained in milk; yet it is difficult to realise that an apparently solid object like the turnip should really contain more water than a fluid like milk. Turnips contain very little protein and carbohydrate; the latter does not exceed even 5 p.c.; pectin and cellulose make up a large portion of the carbohydrate and the frame work of the turnip giving it the solid consistence. Turnips can never be regarded an important form of food, but they are used as condiments for their mustard—like flavour and pungent taste.

in the intestines is nearly complete being practically all starch.

SAGO

Sago is obtained from the pith of the sago-palm; commercial sago contains 86·7 p.c. of starch and is therefore sometimes classed under cereals, so also arrowroot and tapioca.

ARROWROOT

Arrowroot is obtained from the rhizome or root of a West Indian plant, Maranta Arundinacea. The roots are mashed up and washed with water (to get rid of the bitter principle contained therein) and the starch allowed to settle. When dried it constitutes the ordinary arrowroot powder and contains about 82·5 p.c. of starch and traces of protein and mineral matter.

The digestibility of arrowroot and its allies, sago and tapioca, in the stomach is much the same and their absorption in the intestines is exceedingly complete. This gives them a special value in diarrhoea.

As regards the nutritive value of all these preparations it must be said that they are all agreeable forms of starch, but being almost entirely Carbohydrate they should not be taken alone but along with substances rich in protein and fat, such as milk or eggs. Arrowroot or tapioca pudding prepared with milk and eggs, has long been in use even before anything was known of its Chemical Constituents.

A cupful of arrowroot conjee contains only half a teaspoonful of starch and as such does contain only a small amount of nutrition in it, but when milk is added to the arrowroot conjee its biological value is raised and the digestibility of the milk also increased; the mixture therefore, constitutes a wholesome and bland drink for those with a weak or irritable stomach as in dyspepsia and in diarrhoea.

SALEP-MISRI *(Sala misri)*

This is a starchy preparation derived from the roots and tubers of various species of orchids and imported into

Coriander Leaves—(Coriandrum sativum) and *Karibevu (Murraya koenigii)* are used more as condiments than greens and have an inviting flavour and are good appetisers. They contain a large amount of Vitamin A, B_2 and C.

(The Tamil equivalent of Karibevu is Kari-vepa-alai or rather Curry-vepa-alai; the latter is said to be the proper derivation of the word).

Mint—(Mentha viridis)—Pudina—is a common condiment—contains a fair amount of Fe and Vitamin A.

Kakke Sappu (Solanum nigram)—Manithakkali. (Small varieties of tomatoes) in Tamil. The leaves of this plant and the leaves of drumsticks (moringa pterygosperma, winged seeded) are often used as greens either by themselves or mixed with sprouted grains. They have a high Iron content. Drum sticks leaves contain Vitamin A only, while manithakkali contains Vitamin C. Manithakkali leaves cooked as greens, and the dried fruits fried in ghee are a household remedy in Tamil Districts for chronic stomatitis and diarrhoea, the result of Avitaminosis.

Ekpani—Ondalai (Hydrocotyle Asiatica)—is often used as a condiment (like mint) by Hindus on the Dwadashi mornings.

Tender Bamboo Shoots—(Bambusa arundanacea) are often used as food. They have no food value whatsoever and have an acrid alkaline principle, which is got rid of either by soaking the slices in water for 24 or 36 hours or boiling them with acid leaves of hog plums or tamarind. They are not digested at all by the human stomach. Tender bamboo shoots are commonly preserved in brine or made into pickles with hog plums.

OTHER LEAFY VEGETABLES

Brussels sprouts *(Brassica oleracea; bullata gemmifera)* and *cabbage (Brassica oleracea-capitata).*

Cabbage contains Vitamin A, B_1 and C, while Brussels sprouts contain only Vitamin C and a small amount of Iron.

Celery (Apium graveolens rapaceum) contains a fair

of the latter and having seeds also is very common in the West Coast.

Bread fruit (Arto carpus incisa) Bilati chakke—This is a variety of Jack originally the native of Laccadive Islands, hence known as Deevi Jack. It is seedless and the tree is propagated mainly by root cuttings. When ripe they are sweetish, but cannot be used as food unless cooked or fried. They contain a large proportion of starch and sugar, little fibre and are very nutritious but difficult of digestion; their absorption, however, in the intestines is nearly complete being mainly starch.

Mango (green) *(Mangifera Indica)* used mostly salted and made into pickles with mustard, chillies and spices and gingelly oil. Green mango contains about 8 p.c. Carbohydrates, malic and citric acids giving the sour taste and trace of oxalic acid, and some kinds a fair amount of Terpenes (Turpentine smelling volatile oils) which gives the fruit the characteristic flavour. Both green and ripe mangoes contain fair quantities of Vitamin A and C.

Indian gooseberries (emblica officinalis or *Amla)* is perhaps the richest natural source of Vitamin C. It grows abundantly in all Indian forests and is obtainable in almost unlimited quantities from November to March. The fresh juice contains nearly 20 times as much Vitamin C as orange juice, and a single fruit is equivalent in Vitamin C content to one or two oranges. Heating or drying of fresh fruits or vegetables usually leads to the destruction of most or all the Vitamin C originally present. Amla is an exception among fruits, because of its high initial Vitamin C content, because it contains substances which practically protect the vitamin from destruction by heating or drying, and because its juice is strongly acid. Acidity has a protective action on Vitamin C. Hence it is possible to preserve Amla without losing much of the vitamin.

Amla is included in many Ayurvedic and Unani medicines and tonics. Fresh amla was found to be most effective cure for scurvy when an out-break of the disease occurred in 1940 in the Hissar Famine area. Tablets made from Amla powder contain Vitamin C in concentrated

class is known. The cocoanut palm is tapped for the sweet sap, which when fermented becomes toddy.

The tender cocoanut contains the sweet milk, which on analysis has been found to contain 0·5 p.c. protein, 9·0 p.c. carbohydrates, no fat and 90·3 p.c. water. It forms a cooling innocent drink in the hot weather; the fleshy pulp of the tender cocoanut is sweet and nutritious, containing 5·2 p.c. protein, 35·9 p.c. fat, 1·08 p.c. carbohydrates and 48 p.c. water; but the dried kernel from which the edible oil is extracted contains only 3·5 p.c. water, 6·0 p.c. protein, 57·4 p.c. fat, and 31·8 p.c. carbohydrate; it is, however, poor in minerals and vitamins.

The tender pulp is easily digested even by young children, in fact, it forms an important article of infants' food among the agricultural classes.

Cocoanut and its oil form the chief ingredients of vegetarian diet; the nut is very wholesome except for the large amount of fibre contained in it, which is an advantage giving a large quantity of ballast for the action of the bowels. The oil is also used for lighting purposes, in the manufacture of soap and for anointing the head and body.

The cake left after pressing out the oil is an excellent food for cattle and is said to increase the butter element in their milk.

Olive oil (Bassia longifolia) Illuppai; *Ippe*, (Mhowa). Olive oil, is extracted from the kernel of the seeds of the fruits, is an edible oil and has been extensively used in medicine and is useful for lighting purposes. The ripe fruit is very sweet and has a nice flavour and contains 2·5 p.c. protein and 5·7 carbohydrate; the flowers are also sweet and contain a large percentage of sugar. A kind of arrack is produced from the fermented extract of the flowers.

Gingelly Seeds (Sesamum Indicum, or Orientale, Til-seeds). The dried seeds yield on pressure good edible oil containing as they do about 43 p.c. of fat; they also contain protein 18·3 p.c., Carbohydrates 25 p.c. and Iron 10·5 p.c. and Vitamin A. As an article of diet gingelly seeds are, therefore, very nutritious and are usually eaten

in the amount of sugar present that the sweetness of ripe fruit as compared with unripe fruit is due.

The salts of Ca and P (Phosphorus) are but poorly represented among the mineral ingredients of fruits in general, but oranges are a good source of Ca, and for this reason the free use of fruit in place of cereals has been recommended to persons suffering from atheroma (pipe-stem arteries) and high Blood Pressure.

Most of the fresh fruits are rich in vitamins especially Vitamin C, the antiscorbutic principle.

The flavour of fruits is due to the presence of certain etherial bodies, which in some cases defy chemical investigation. In many cases, however, artificial products having the same flavour as many fruits have been synthetically produced from coaltar etc. These products form the basis of different fruit-flavourings and essences sold in the market.

Although of no nutritive value the flavouring agents contained in fruits are by no means to be despised as they are stimulants to the appetite and aids to digestion. But their fuel value is practically nil.

Cooking renders most fruits digestible by softening the cellulose and converting the gum (pectin) into a jelly; but these changes are not brought about without a good deal of loss, and where the fruit is cooked by stewing and the juice also eaten along with it the loss caused by cooking is negligible.

The digestibility of fruit in the stomach and the intestines is largely dependent on the nature of the fruit and its degree of ripeness. Ripe fruits are more easily digested than unripe fruits as the amount of cellulose in the latter is greater.

Excessively sour-fruits do give rise to colic or diarrhoea from irritation of the intestines, but if the amount of acid and of the cellulose contained in the fruit be moderate the gentle stimulation which they exert on the intestinal wall may be wholesome as in constipation. Stewed fruits are therefore so serviceable an addition to diet in sluggish action of the bowels.

Regarding their absorption major part of the Carbo-

into a jelly. They contain Vitamin A and Vitamin C in large quantities. The kernel of the seeds is very nutritious and is said to contain Vitamin B_1.

Jack fruit contains a large p.c. of sugar as much as 18 to 20 p.c., but being fibrous it is difficult of digestion and gives rise to colic and diarrhoea. Jack fruit contains Vitamin A in fair quantity and Vitamin C also. Jack seeds, we have seen, contain 38 to 40 p.c. Carbohydrates, 6·6 p.c. protein and traces of Sulphur, Iron, Phosphates and also small quantities of Vitamin B_1 and B_2. Seeds contain no fat.

Jambu fruit (Eugenia jambos)—nerale—has 20 p.c. Carbohydrates and trace of organic acid. It is devoid of any vitamins.

Sour-Soup—odamba—a sour fruit used as a condiment and used for soups.

CITRUS FRUITS

There are nearly seventy varieties of citrus fruits grown in India alone. The commonest are:

1. Citron—Citrus medica—*mavaling*—is either sweet or sour.
2. Lime fruit—Citrus aurantifolia—*limbehuli.*
3. Lemon—Citrus limonia.
4. Bitter Orange—*kadaranga*—Citrus aurantium—is mostly used salted as pickles, is a liver stimulant and is useful in jaundice and enlarged spleen.
5. Mozambique Lemon—*musumbi*—(Citrus limotoidis).
6. Batavian Orange—(Citrus Madras patana).
7. Bomblimas—Shaddock (Citrus grandis—Citrus Decumana. Pumelo—*toranda.*
8. Grape Fruit—Citrus paradisii.
9. Sweet Orange—Citrus nobilis.
10. Satkudi Orange—Citrus Sinensis.

One variety of lime, known as Citrus limeta, *(gaja-limbe)* elongated in shape, is very sour but has no particular flavour. They are used only salted or as drinks with sugar.

All the varieties of Citrus contain Vitamin C; oranges,

the object of evaporating in that way being to preserve in active form the diastase ferment present in the malt.

Malt is a nourishing and fattening food and helps when combined with other foodstuffs the digestion and absorption of such foodstuffs especially the cereals. Malt contains Vitamin A, B_1 and C.

Malted foods like Horlick's Malted Milk, Benger's food, Ovaltine etc., are prepared from barley malt.

A method of preparing malted food from cholam has been evolved by the Agricultural Chemist at Coimbatore (S. India) which is as follows:

"The grain (cholam) is soaked in water for a day during which period the water is changed four times. The wetted grain is allowed to sprout for 3 days and dried in the sun. The sprouts and husk are removed by pounding in a wooden mortar; and the husked grain gently roasted till a fine aroma is given out. Fine malted flour from the crushed grain is fit for use in different ways:

"In the sick room a thin "conjee" of the flour with milk and sugar helps to nourish the patient. By suitably altering the consistency this beverage can be given to children and people with weak digestive powers. For general use even by the healthy it can be mixed with cocoa to make it more sustaining. The malt flour when mixed with wheat flour and other ingredients can be used in the preparation of Biscuits or Cakes."

Malt—making as a cottage industry has a wide scope as it is applicable to other cereals as well.

JAGGERY

This is prepared from sugar-cane juice, palmyra juice or juice of the bastard date. The raw juice is boiled until thick and syrupy and then poured into moulds to harden into solid cubes. The jaggery so produced is generally unclean, dark and unattractive. It was therefore felt that development of a method for the production of a superior type of jaggery was an absolute necessity. Investigation carried out in this respect have materialised in a method at once suitable and practical in the hands of the small as well as big cane-growing ryot. The method is as follows:

importance, and the necessity for a free intake of it is indicated in fevers, gout, diabetes, kidney affections and in habitual constipation. It is, therefore, a great folly and is even dangerous in cases of diabetes, for instance, where large quantities of urine are daily passed, to minimise the quantity of water-intake with the hope of reducing the amount of urine passed. Thirst, which is the indication for more water, should be the guide, and no water should be spared so long as thirst is present.

Water should always be taken slowly and in sips. Drinking a large quantity of cold water especially when the body has become heated from exposure to sun or heat or is fatigued, has ended in some cases in death by sudden stoppage of the heart.

On the other hand, sips of cold water or dashing cold water to the face and chest are useful in fainting fits and collapse by gently stimulating the heart and respiration.

Hot water taken in sips is a good gastric sedative in cases of persistent vomiting from any cause; so also iced water or ice.

Warm or tepid water, on the other hand, especially if taken in large quantity, induces vomiting; and is a safe and readily available home-remedy in cases of poisoning. The emetic action of warm water is helped by tickling the throat with the fingers.

In some forms of dyspepsia where there is hyperacidity of the gastric juice giving rise to a dull sickening type of colic, relief is at once obtained by taking in a tumblerful of hot water with or without a few grains of Sodium Bicarbonate in it.

The effect of hot water fomentations over an inflamed part is to allay pain and reduce the swelling and hasten resolution; and if pus has already formed hot fomentations do hasten its coming to the surface, 'pointing' of the abscess as it is called.

A good drinking water should have no colour, no odour of any sort, have a pleasant fresh taste and contain a moderate amount of solid matter (not exceeding about $8\frac{1}{2}$ grs. per gallon); a wholesome water should contain very little organic matter and that too should be of vege-

which substance is said to be free from the injurious effects of free tannic acid, but is probably devoid of the ordinary physiological effect of pure theine.

In the preparation of good drinking tea the fault lies oftener with the method of infusing than with the quality of the tea leaf employed. The tea should really be infused, not boiled or stewed as is often done. The character of the water is also of the utmost importance. The Chinaman's rule is "Take the water from a running stream, that from hill-springs is best, river water is the next and well water is the worst." This means that the water should be clean and well aerated (with air or carbonic acid). As prolonged boiling drives away all air from the water and makes it flat and insipid it is necessary that it should have just freshly come to the boil, and if it is already flat it is a good plan to pour the water into a jug from a height (as one often does in order to cool hot coffee or tea), for this causes the water to take up some air again.

The water should not be hard, for the Ca salts seem to interfere with the proper extraction of the constituents of the leaf; nor should the water be soft, as too soft a water seems to extract more of tannin than a hard water. Moderately soft water is therefore, the ideal for making tea.

The quantity of tea leaf is of some importance. The common rule—a teaspoonful for each person and one for the pot—is very indefinite and uncertain; for the weight of a teaspoonful of tea leaf is very variable depending upon the looseness of the rolling of the leaf. For, in the economical preparation of good tea the thorough crushing of the leaf is of great importance, so that the ingredients may be readily extractable. Powdered tea is ideal in this respect and Tea-tabloids do deserve a word of praise for the same reason.

The water, then, having been freshly brought to the boil, the empty tea pot should be thoroughly rinsed with this water; the required quantity of the tealeaf is put into the pot while still hot and hot water poured in and the pot kept covered for 3 or 4 minutes; after which the infusion can be strained and poured into another pot (pre-

us to distinguish good food from bad food, and instead of using them for this legitimate purpose, man often pampers them with highly seasoned foods and drinks, so much so the nerves of taste in course of time become degenerated and come to indefinitely demand the continuance of such foods. The stomach also becomes worn out having to deal with a large amount of food material of a nature quite unsuited for the supply of the real needs of the system. The result is that digestion is impaired and products of imperfect digestion and consequent fermentation do accumulate in the system, rendering it liable to the onset of diseases and disorders like dyspepsia, gastric ulceration, diarrhoea and emaciation.

Cooking improves the appearance of food and develops in it new flavours, and efficiently sterilises it and enables it to keep longer. It also increases the digestibility of vegetable food, and is said to improve the digestibility of meat, possibly by loosening its fibres. On the whole cooking adds to the digestibility of all foods possibly by calling forth a more profuse flow of saliva and the gastric juice by their attractiveness and flavour. Even the thought of savoury food makes the mouth 'water' and indirectly the stomach also.

We have already seen that cellulose and raw starch are incapable of digestion by the human stomach; cooking softens and ruptures the cellulose frame work of vegetable foods and gelatinises the starch granules and renders them easily digestible.

Even in very careful cooking a certain amount of loss of the soluble constituents of food during the process is inevitable. In the case of meat the loss is more or less entirely confined to the extractives and salts and water; but in the case of vegetable foods the loss of salts especially is often considerable, but as regards water vegetable foods tend to become richer in water when cooked instead of losing it, as meat does.

Slow cooking. Food being a bad conductor, heat penetrates into it very slowly, and if heat is applied too rapidly to a piece of meat, for instance, the fuel is simply wasted and one runs the risk of over cooking only the outer

and make one wish for more, but with little heed in majority of cases to their nutritive or hygienic value; and although in this respect the moderners have outbeaten the ancients the main processes of cooking, like roasting, baking, boiling etc., now in vogue still belong to the barbaric stage of culture and retain their prehistoric origin.

"UNFIRED" DIET

Some eminent people especially strict vegetarians, but who have no objection to taking milk or its products like curds, butter-milk and butter, do advocate the use of unfired foods and thus raise the cry of 'back to Nature.' This looks very plausible at first sight, but a close examination of the question will show the fatal flaw. We have been slowly but surely getting away from nature for thousands of years, and there seems to be no reason for us to revert at this stage of our life to the times when man was inarticulate, was covered with hair and lived in caves or in trees; we have enjoyed a state of civilisation too long to go back to Nature, when there would be no art, no learning, no Science nor any of the amenities that dignify and beautify life; and we have already shown that in the case of fruits and some kinds of nuts it may not be necessary to apply heat to them as then their taste may be spoiled in the case of some at least or their vitamins destroyed by heat, but it is necessary to boil milk, green vegetables and cereals before use, to improve their digestibility and kill any disease germs that might have gained access to them.

* * * * *

"He that dieteth himself prolongeth his life."
(Ecclesiasticus).

How true are these words! How well worthy of a constant place in our memories! Yet what pains are taken to apologise for a life contrary to these precepts!

person may be born with gross or minute structural defects rendering some organ of the body incapable of performing its normal function; or certain of his tissues may be defective in that they rapidly degenerate or wearout; on the other hand injury may be produced by external agents such as cold, heat, mechanical violence, poisons taken with the food or the entrance of disease-germs.

These two causes, however, may in some cases interact. Thus, a disease-germ may be *unable* to establish itself in the body and induce disease except in the presence of some hereditary defect in the resisting power of the individual, while those who are the subjects of manifest hereditary weakness may be able to survive if their environments are modified. Thus, premature babies can be reared in artificial incubators, or diabetics may suffer no inconvenience if protected from all possible sources of injury; the hereditary defects consisting in a failure of these organisms to adjust themselves to ordinary external conditions, which, in the instances mentioned are actually injurious.

Now, the tendency for inherited disease exists either in the ovum itself or is acquired by the ovum in the act of fertilisation. In normal development certain organs manifest their inherited tendencies many years after birth; for example, the generative organs both in the male and female develop at puberty and get atrophied as age advances. Similarly, inherited tendencies to disease may not show themselves until a late age in life; for example, cancer generally occurs at late age, say after the 50th year; and cancer of the breast or the uterus appears in the female about the time of menopause, generally after the 45th year.

Possibly in many cases the same unrecognised conditions that induced in the parent the morbid tendencies that are transmitted to the offspring, continue to act on the latter also until the actual disease becomes evident with or without some obvious exciting cause.

We cannot say when this tendency to disease begins, maybe it has been slowly gaining strength for generations; and the fact that a progenitor had not the disease in question and that he or she lived well past the age at which

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bance of function is slight complete health may be recovered, and if the impairment of function is sufficient to arrest its activity necessary for continuance of life the organism dies.

Where the cause of a disease remains active the disease might continue indefinitely and become *chronic.* In chronic diseases the patient's nutrition suffers so severely that his power of resistance to bacterial invasion is lowered, and the bacteria are enabled to establish themselves and finally cause death before the effects of the original malady have reached a fatal degree; such infections are known as "terminal infections."

B. EXCITING CAUSES OF DISEASE

The essential causative agents in something like 80 p.c. of all recognised disease—entities are now known to Science; they are all extraneous in origin, that is, they are foreign to the animal body, in which they produce their harmful effects. This would leave about 20 p.c. of diseases in which the essential cause has not yet been identified. This limited number of diseases (whose causation is unknown) is, however, rapidly diminishing and each year finds one or more of them explained. A certain number of these little-known conditions are comprised in a group or groups variously named as "Constitutional" or "Metabolic" or "Endocrine" diseases. Among these are diabetes, gout, gigantism, myxoedema etc.

Among the 80 p.c. of diseases, whose causation is known, 30 p.c. of the whole are due to *inanimate* agents, physical or chemical in nature, such as injuries, heat, cold, changes in atmospheric pressure, electrical energy and chemical poisons, each one of these causes producing a form of disease like wounds, burns, heatstroke, frostbite, caisson disease and mountain sickness, alcoholism etc.

The remaining 50 p.c. of all diseases are due to *external animate* agents such as bacteria, yeasts, fungi, spirochetes, filtrable viruses, protozoa and animal parasites.

Among the same external *animate* agents there is an almost indefinite number of similar but non-disease-producing plant or animal microbes, which are of interest to man from zoological, industrial and economic aspects.

gress of the embryo is finally arrested hooklets disappear and a fully formed head develops, and the parasite comes to be enclosed in a fibrous capsule. This stage is known as the *intermediate* or cystic stage; and the parasite is now known as the cysticercus (meaning enclosed in a capsule). In this state the parasite might live for many months or might soon die.

If, however, the tissues containing living cysticerci be swallowed by an animal capable of acting as host of the mature worm the investing capsule is dissolved off and the head is set free. Some of these might become attached to the mucous lining of the intestines, when, segments will quickly develop from the free ends. Two months generally elapse between swallowing of the cysticerci and first passage of the segments from the rectum.

Four varieties of Tape-worms are commonly parasitic in man. Three of them are found in the intestines, namely, Taenia solium, T. saginata and Dibothriocephalus latus; and the fourth, T. Echinococcus does not infest the human intestine but is found in its intermediate stage in the human liver and other parts. Each kind is recognised by the microscopic appearances of the head and of the segments. They are several feet long and consist of a large number of segments, except the T. Echinococcus which is only 1|4 inch long and consists of only 4 segments.

Their chief host is man, but of the T. Echinococcus is the dog and the wolf, in whose intestine the adult worm is found. Their source of infection to man is mainly through eating of infected pork or beef or mutton ("measly pork" or "measly beef") and lake fish like pike and trout, too insufficiently cooked to destroy the cysticerci present in them.

Effects. The effects produced are generally so slight that the presence of the worm is unsuspected until the detached segments of the adult worm are passed per annum, but, slight intestinal colic and even convulsions and other nervous disorders occasionally ensure especially in children. These effects are due either to mechanical irritation or the absorption of certain toxins or poisons formed by the parasites.

Dibothriocephalus latus is said to produce symptoms

such as squatting on bamboos placed 6 inches above the ground over pits or drainage channels. In Southern India experiments are being made with latrines consisting of deep holes bored in the ground by a special machine and the results are said to be promising; but these deep pits are a disadvantage so far, as the nitrification of the faecal matter is rendered a difficult and slow process, whereby the manurial value of the faeces comes to be practically lost to the soil being placed too deep down in the ground. Hence such pits need not be more than about 3 feet deep; but if they are less than 2 feet the larvae from the faeces will be able to work their way to the surface of the soil in the immediate neighbourhood.

Wearing of boots by the labourers to prevent the access of the larvae to the skin of the foot is advised, but unfortunately the affected class of population is too poor to afford them. Moreover the enforcement of effective sanitary measures has been found to be very difficult even in the best managed estates.

In the West the most serious infections occur in the Tropical Zone, where high temperature and heavy rainfall coexist. The Southern United States, West Indian Islands and the North of South America as far as Brazil and Argentina are places where a serious amount of disability is caused. In the dry portions of South East Asia and dry adjacent North West parts of India the infections are few and the effect of these on the health of the people was everywhere practically negligible (Chandler).

In the Sub-Himalayan divisions of Northern India from the United Provinces to Assam the incidence increases from West to East with the increasing rainfall and humidity and reaches its maximum in very humid Assam, which has six months or more of rain, but with the exception of humid Assam, Burma and Malabar, Chandler found that the average number of worms each individual harboured was rather low and the amount of disease produced was not serious.

The extensive Hookworm Campaigns of the Rockfeller Foundation in many parts of the world have revealed certain facts regarding the percentage of people infected and the degrees of their infestation. The importance of

scrotal skin. The fluid of these vesicles may contain microfilariae.

(4) Varicose lymphatics in the groin from obstruction of the lymphatics by adult filariae affecting generally the femoral and inguinal glands. They form soft and painless swellings over which the skin can be freely moved.

Geographical Distribution. This parasitic worm is very widely prevalent throughout the Tropical and Subtropical Zones of the New and Old world. It is especially common in some of the West Indian Islands, such as the Barbados and in British Guiana, in low lying deltaic areas in the East Indies, on the East Coast of India, West Coast of the Madras Presidency and Travancore. It is endemic in some parts of China, in the Coastal area of Queensland, in many of the Oceanic Islands, in some of which according to Manson-Bahr about 60 p.c. of the people seem to be infected. It occurs throughout Tropical and North Africa with very high recorded rates of infection in Nigeria and Tanganyika and in America from the Southern United States to Brazil.

The incidence of the disease varies greatly even in neighbouring localities, so that very high prevalence in certain areas may occur without a high incidence in the country as a whole.

The endemicity depends upon the presence of mosquito-carriers of the disease and to the existence of heat and moisture in the air; and the racial prevalence noted above probably depends upon the liability to infection through living in close proximity to the infected persons and general unhealthiness of the place.

Prevention—As it is usually those that show no signs of disease who harbour most micro-filariae in their blood the only feasible method of prevention will be the use of mosquito curtain at night; and living as far as possible away from the endemic areas.

Filaria Medinensis (Guinea worm). This worm invades in man the connective tissues usually of the feet and legs and causes a blister, which bursts with the escape of a number of embryos of the worm. Sometimes the adult

access to the body disease did not develop. Since then, our knowledge of disease-germs has grown immensely and although our knowledge about all disease-causing germs is not yet complete we may presume that most of the infectious diseases are caused by them. It is important to learn how we may protect ourselves from the germs and the sufferings they cause. It is by understanding their real nature that we can best combat them.

The germs leave the body of the sick and get into the body of the healthy individual, and under particular circumstances do give rise to disease in the latter. Inspite of all precautions we take the germs do reach our bodies and get inside them, cause weakness, fever, inflammation, pain etc., which tell us that we are ill. In most cases the body wins in the struggle, the germs are killed and the damaged tissues repaired as well as practicable.

The Infectious diseases are caused by living pathogenic micro-organisms.

They are: (1) The Protozoa
(2) The Bacteria and the Spirochaetes.
(3) The Filtrable viruses.

The protozoa are animal parasites and include the malarial parasite, parasites of trypanosomiasis and kala-azar and of the amoebic type of dysentery and Tropical liver-abscess.

The spirochaetes are more allied to bacteria than protozoa and bring about certain forms of relapsing fevers, rat-bite fever and infectious jaundice. Syphilis is caused by a spirochaete.

They will be described in connection with the diseases they cause.

1. BACTERIA

These are minute unicellular masses of protoplasm belonging to vegetable class but devoid of chlorophyl and a definite nucleus. They are about 1|25000 of an inch or low or submultiples thereof, so that from 5 to 50 thousand of them are required to make a row one inch long, and a single layer of Typhoid Bacilli on a pinhead would contain more than a million bacteria.

anthrax are ordinarily present in road-dust and manure-heaps.

The routes by which bacteria enter the body are various. The commonest infectious diseases like Diphtheria, Tuberculosis and Influenza leave one host and enter into another by the respiratory tract; the sputum or mucus in droplets sprayed out from the mouth and nose during laughing and sneezing contain infective material laden with their specific bacteria; over-crowding and lack of adequate ventilation favour the infection in those, whose powers of resistance are low.

Another group of organisms gain entrance into the body by the mouth, e.g., germs of typhoid, cholera and dysentery. These are chiefly spread by healthy carriers and by flies which feed on excreta and transfer the organisms to our food and water.

Veneral diseases such as gonorrhoea and syphilis are usually transmitted through direct contact between the person harbouring the organisms and the one about to be infected.

Tetanus bacilli can gain entry into the body only through open wounds and not through intact skin or through the mouth; if they enter by the mouth they are either killed in the stomach at once or do not survive there long.

Many diseases like rabies in dogs, anthrax in sheep and glanders in horses are transmitted to man through infected animals. And diseases like malaria, plague, yellow fever, yaws, kala-azar, we shall see later, require the action of some blood sucking insect—vector to transmit their specific viruses from the infected to the healthy.

Now, in order that a particular organism may cause an infectious disease the association of a number of factors have to be taken into consideration; briefly stated they are:

(1) The virulence of the specific organism.
(2) The number of bacteria actually invading the host.
(3) The channels of infection; and

fective properties for long periods inspite of desiccation in the sun, as the presence of the gelatinous matter in the sputum often affords sufficient protection to the bacilli from these influences. Survival of bacteria outside the host depends in some cases on their ability to form "spores," which, as we have seen, are very resistent to the external harmful conditions like drying, heat, sunshine etc.

ENTRANCE OF INFECTIOUS AGENT INTO A NEW HOST

The simple presence of a disease-germ on the external and naturally protected surface of the body is not sufficient to produce disease; for example, the diphtheria bacillus is frequently seen on the skin, and the pneumococcus in the mouth; and for several reasons a healthy carrier of this sort does not fall a victim himself to the disease for which the germs he harbours are responsible; it may be that he has already acquired a kind of immunity against the particular microbes, or that the microbes have not reached the specific portal of entry, or, and what is more probable that the individual's power of resistance to disease has not in any way been lowered.

In the case of extremely virulent bacteria such as the plague bacillus or the anthrax, no special portal of entry is necessary, a simple abrasion or a pin prick on the skin sufficient to destroy the protective epithelium will be sufficient for the bacteria to get a point of entrance into the subcutaneous tissues, whence they rapidly invade the lymphatic and blood circulation producing septicaemia (blood poisoning by actual bacteria).

Several cases of "malignant pustule" in man have been traced to the use of shaving brushes prepared from horse hair derived from animals that died of anthrax. These cannot be efficiently sterilised before being marketed on account of the extreme resistance of the anthrax bacilli and their spores even to very high degrees of heat. With less virulent and more selective parasites a specific localisation should be reached before infection can begin. The cholera vibrio, the typhoid bacillus, the pneumococcus and the malarial parasite, for example, are quite harmless

the gall-bladder or bone marrow, where they remain for indefinite periods after recovery from active disease.

Mode of action of an infective agent in the body. Once lodged in the body of the host and having multiplied and spread to the extent of its capacity and in a manner characteristic of its intrinsic properties an infection makes known its presence by certain signs and symptoms, which are both local and general.

(1) The most striking local sign is *Inflammation* with its cardinal characteristics of pain, heat, redness and swelling and disturbance of functions of the affected part. Inflammation may occur either simply at the portal of entry or in multiple places where the active agents have collected, and the character of the inflammation depends upon the nature of the bacteria. Thus, the diphtheria bacillus produces inflammation of the fauces with the formation of a fibrinous membrane; pus-cocci produce pus in the inflamed area; tubercle bacilli form the characteristic "tubercles"; typhoid fever is characterised by the accumulation of large mononuclear type of white blood-corpuscles with phagocytic properties.

Now, Inflammation should not be supposed to be evidence of hopeless injury but rather indicative of a more or less successfully maintained defence mechanism. Even pus, an apparent evidence of destruction and disintegration is composed of discarded cells that have taken part in combating the invading parasite; a vigorous local inflammation at the portal of entry is indicative of superior resistance on the part of the host, and the absence of reaction means an unfavourable prognosis. Low fever in Pneumonia is always indicative of low resistance-power of the patient and forebodes evil.

(2) Among the general symptoms that are the peculiar accompaniments of all infections are *Fever*. The cause of fever in bacterial or protozoal infection is most readily explained by attributing it to liberation of certain split-proteins through disintegration of these alien cells and these split-proteins are known to be "toxic". It has been found that the protein structure of each of the patho-

diseases contains the respective anti-toxin, which is employed in the treatment of those suffering from these diseases. Such sera are called anti-toxic sera.

What is known as antibacterial or anti-microbic serum is prepared by injecting into animals increasing doses of the culture containing the specific micro-organism. Such a serum, has, however, been found, as a rule, not to have much curative value, though it may be used as a prophylactic or preventive measure. Among the bacterial sera which have been so far prepared are the anti-typhoid, anti-cholera, anti-plague, anti-pneumococcus and anti-streptococcus. In these diseases, however, the specific microbes do not secrete powerful soluble toxins, which might be employed to evolve corresponding anti-toxins in animals and then provide us with curative anti-toxic sera; because the toxins appear to be largely "intracellular" toxins, in the sense of being contained within the bacteria themselves and only liberated when the bacteria die or disintegrate. The immunity that arises in such diseases (whether the diseases are the result of artificial inoculations or ordinary spontaneous attacks) is attributable *not to a single substance like anti-toxin* but to a *bacteriolytic or bactericidal agency*, which consists of two elements.

One of these is the specific anti-substance, (1) the immune body—developed in the course of the immunising process; the other is normally present in blood-serum and is known as the (2) complement or alexin.

The immune body operates by linking itself on the one hand to the Bacterium and on the other hand to the complement thus enabling the complement to destroy the bacteria.

Unfortunately the complement or alexin is not materially increased in the immunising process; moreover it is unstable and soon disappears when the serum is kept under the usual conditions.

There is still a third process in Immunity; *viz.*, that instead of killing the microbes by the agency of Immune body and complement, the anti-bacterial serum of an immunised animal may operate by increasing the suscepti-

German observers began to record a series of investigations which indicated the presence in the fluid-elements of the blood serum and plasma of properties which are destructive for bacteria. This theory does not much differ from what we have already outlined above.

Both the phagocytic and the humoral theories can be said to be inter-related to each other in as much as the attraction of the Phagocytes to the seat of infection is entirely dependent on what is known as the chemotactic effect of the microbes themselves.

3. THE NATURAL POWERS OF PROTECTION OF THE BODY

We have discussed in the foregoing pages the natural powers of resistance of the human body to the attacks of microbes of disease and have seen that the efficiency of the protective mechanism determines the difficulty with which disease is produced or the susceptibility of the host is increased, and that these defences of the host are:

(1) The protective coverings of the exterior of the body, *viz.*, the skin and the mucous membranes. These are barriers to the majority of the micro-organisms, but a slight injury may, however, permit the entrance of the microbes through these natural barriers; while some of the filtrable viruses can even penetrate the intact skin.

(2) Antibodies which neutralise the toxins of disease, injure or destroy the micro-organisms and prepare them for phagocytosis. In addition there are ferments and tissue-fluids, which may destroy micro-organisms and digest them as well as the products of disease.

(3) Phagocytes—The Leucocytes and the Reticulo Endothelial cells,—which may ingest and destroy the microbes. In most instances the antibodies are necessary to prepare the bacteria for phagocytosis. Inflammation consists in the attraction of the phagocytes (chemotaxis) to the seat of irritation. Inflammation is always followed by repair.

In addition to these, there are other factors which help the body in warding off disease or injury.

Starvation and improper food do act by cutting off the food itself of the vital force. Overeating, like drinking and smoking and such other habits, is as universal as the human race and is distinctly harmful and involves a heavy drain on man's vital powers.

Indulgence in passions is another fruitful source of "diminished vitality, crippled usefulness and shortened life;" and unfortunately the victim is not conscious that his powers are being under-mined, but there are abundant proofs that it is true notwithstanding.

Scientists maintain that the pursuit of pleasure for pleasures' sake wherein any physical act is involved is not lawful and violation of this law always results in a greater or less diminution of the powers of life to withstand disease; and if one day mankind be persuaded to refrain from indulgence in the sexual relation except for the purposes of procreation, half of the ills of flesh would disappear from our planet, and an amazing improvement in greater freedom from nervous diseases and, in fact, from all diseased conditions would be at once manifest.

This list could be further extended, but it is hoped that enough has been said to impress on the thoughtful reader the great importance of this subject, and that because there is no daily record of the damage done to the system by overwork, overeating, sexual excesses, insufficient sleep, by the use of stimulants and narcotics etc., it does not follow there has not been a daily deterioration of natural forces of the individual. Indeed there is abundance of evidence to prove that such deterioration is inevitable. Thousands of persons, now occupants of mental hospitals, and tens of thousands who are suffering a living death of gloom and melancholy because of a debilitated nervous system, are the victims of the various habits, excesses and dietetic errors.

III. CONTROL AND PREVENTION OF COMMUNICABLE DISEASE

To recapitulate what we have already seen regarding the causation and the mode of spread of infectious diseases

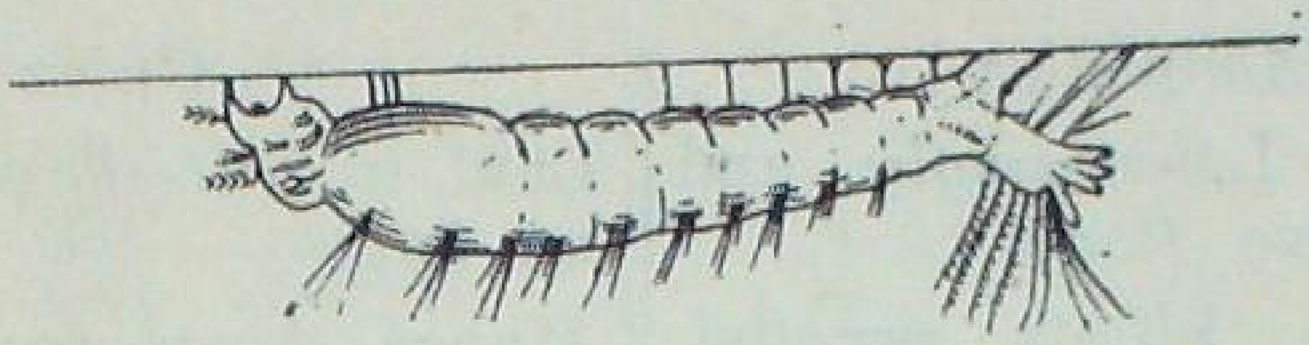
places in our country and in most of these there is a lack of cleanliness which is appalling even to the laymen. We do not have to be Bacteriologists to suspect the presence of germs when our coffee cups wear a garland of second-hand lip-stick or red colour of betel-stained saliva. In several cases there have been found 250,000 germs of varieties on each glass, of which 40% were disease-producing germs. One record-breaking discovery in a bar was rinse water with a bacterial count slightly in excess of that for good ripe sewage.

"Alcohol kills germs" you may say. No doubt it does, but only in a drink of strong alcohol and if the germ stays in it long enough and if the liqour is poured up to the danger-point, that is, up to the brim. Hence if the rinsing is perfunctory and the water only warm, the drinker's lips may pick off the glass some of the germs left there by the previous customer.

So also the plates, the spoon and the forks in public restaurants may also be the means of carrying germs from the sick to the healthy.

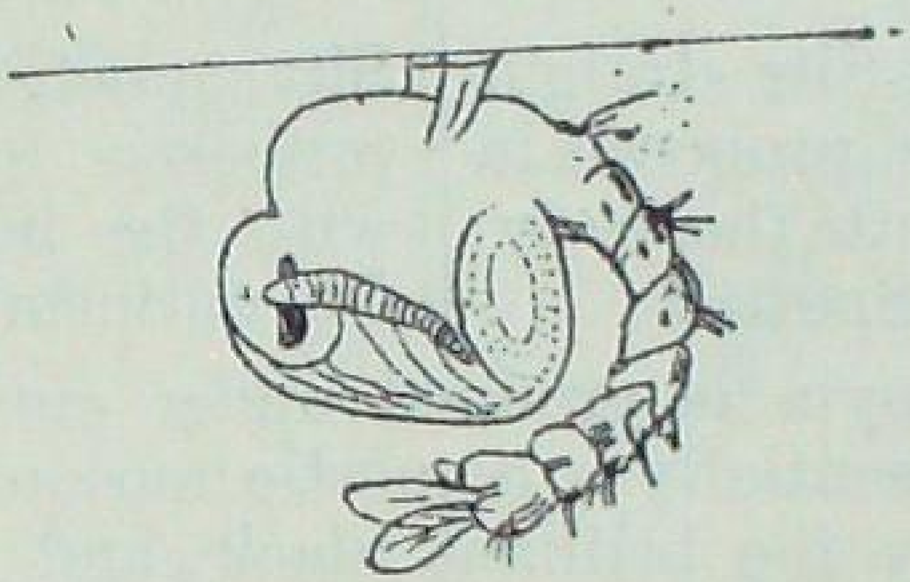
Scalding utensils, spoons and forks in hot water before and after use is the only known method of preventing infection through them. In fact in most cities the law insists that no license-permits should be given to restaurants until they instal facilities for washing utensils in boiling water,—surely not a difficult requirement. In fact by this means, so simple that it can be used everywhere in public places and in private houses, the risk from bacteria can be done away with or at least greatly reduced.

Articles of food and drink readily act as vehicles of infection; milk, because it acts as an admirable medium for the growth of most organisms and also because of the possibility of its being infected during handling, is especially liable to carry disease-producing organisms. Water is readily polluted by excreta and thus scatters infection; but the air is probably unimportant in this regard, for expired air does not in itself contain germs; it is only when it is laden with droplets of excretions derived from the respiratory membranes, or when the air is filled with dust, that air-transmission of disease may occur.



(Fig. 11 (b)

Anopheles Larva



(Fig. 11 (c)

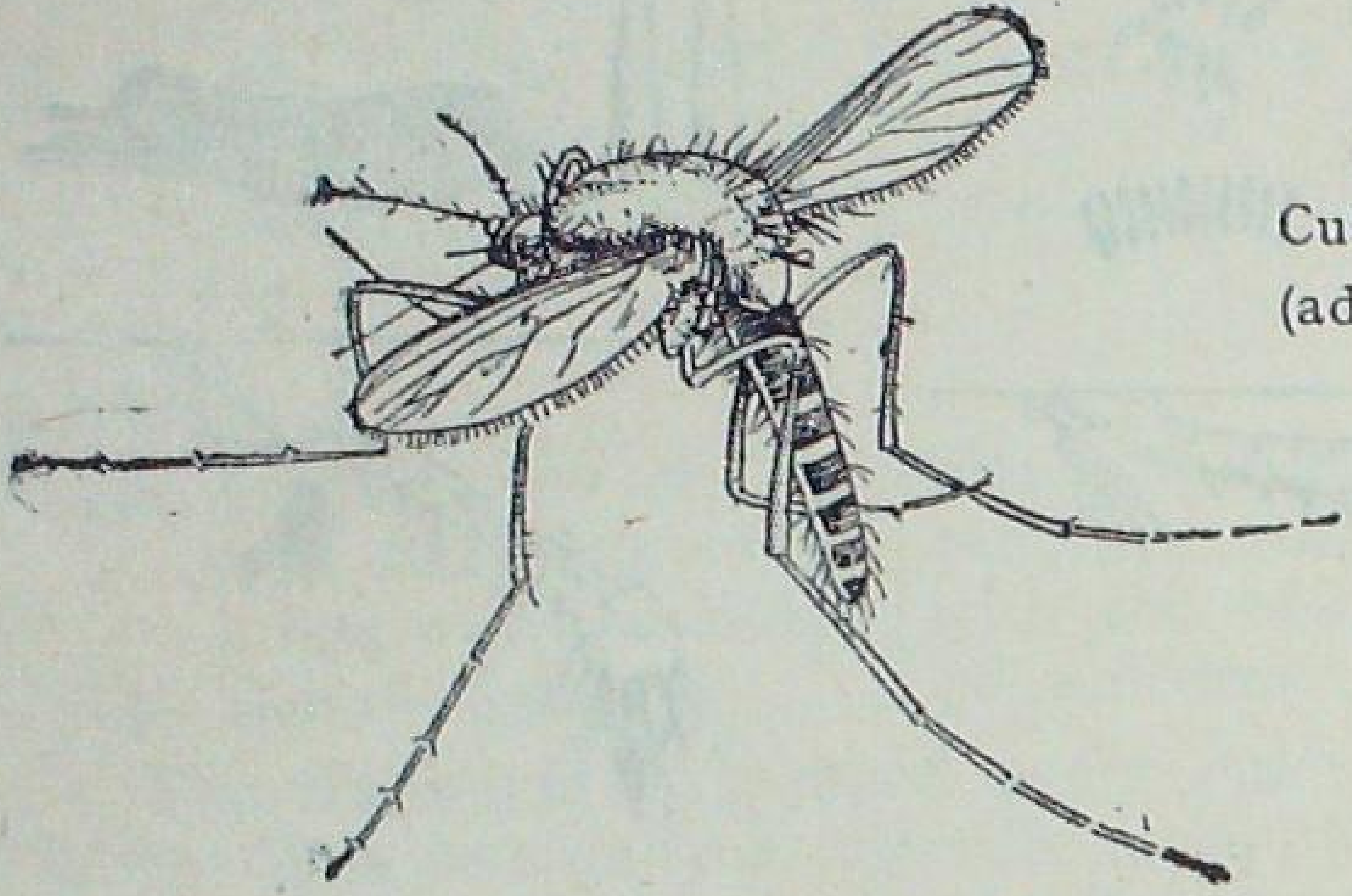
Pupa—Anopheles

The pupa is, as we have seen, a resting stage in the development of the adult mosquito, at which the various parts of the adult insect get fully formed. The pupa is also active and moves by jerks; it does not feed, but requires oxygen for breathing, which is accomplished by means of the two trumpet-shaped breathing siphons placed on either side of the body.

The adult mosquito is easily recognised by the manner in which it rests. The culex and the stegomyia rest in a "hunch backed" manner with the proboscis forming an angle with the line of the abdomen, but the anopheles rests differently, the line of the proboscis being continuous with the line of the abdomen. Another characteristic of the anopheles is the presence of clearly marked black and white spots on the wings; such spots being usually absent in either the culex or the stegomyia.

The following is a summary of the differentiating characters of the Anopheles and the Culex. (Fig. 12).

they always prefer the blood of rabbits to human blood; and advantage has been taken of this fact to rear rabbits



(Fig. 13)
Culex fatigans
(adult—female)

in human dwellings to minimise the attacks of the mosquito on man.

To prevent mosquito-bite the following is recommended:

Anti-mosquito paste.

Camphor	1 ounce
Menthol	1 ounce
Oil of citronella	5 min.
Oil of Turpentine	10 min.
Castile soap	3 ounces
Kerosene oil	1 dram

Rub the menthol and Camphor in a mortar and add the citronella and Turpentine oils; next add the soap and Kerosene oil and mix well. (*G. O. H. Madras*).

Composition of "FLIT"

Kerosene oil	1 gallon
Phenol	200 c.c.
Creosote	50 c.c.

Mix well.

B. THE SAND FLY. (Phlebotomus papatissii)

A minute insect belonging to the genus Phlebotomus,

absent flies will naturally lay their eggs in other decomposing material and careful attention to all such organic deposits is therefore essential.

(2) Control of fly-breeding must be supplemented by efforts to destroy the adult flies. Sticky flypapers, particularly the long slender roll hung from the ceiling are helpful. So also fly swatters.

The best device for dealing with adult flies, however, is a trap (Fig. 16) of the following description. This device depends upon the tendency of the fly to go towards light. It consists of a wire-gauze cone with a large opening at the bottom and a small opening at the top, which opens into a wire-gauze cage.

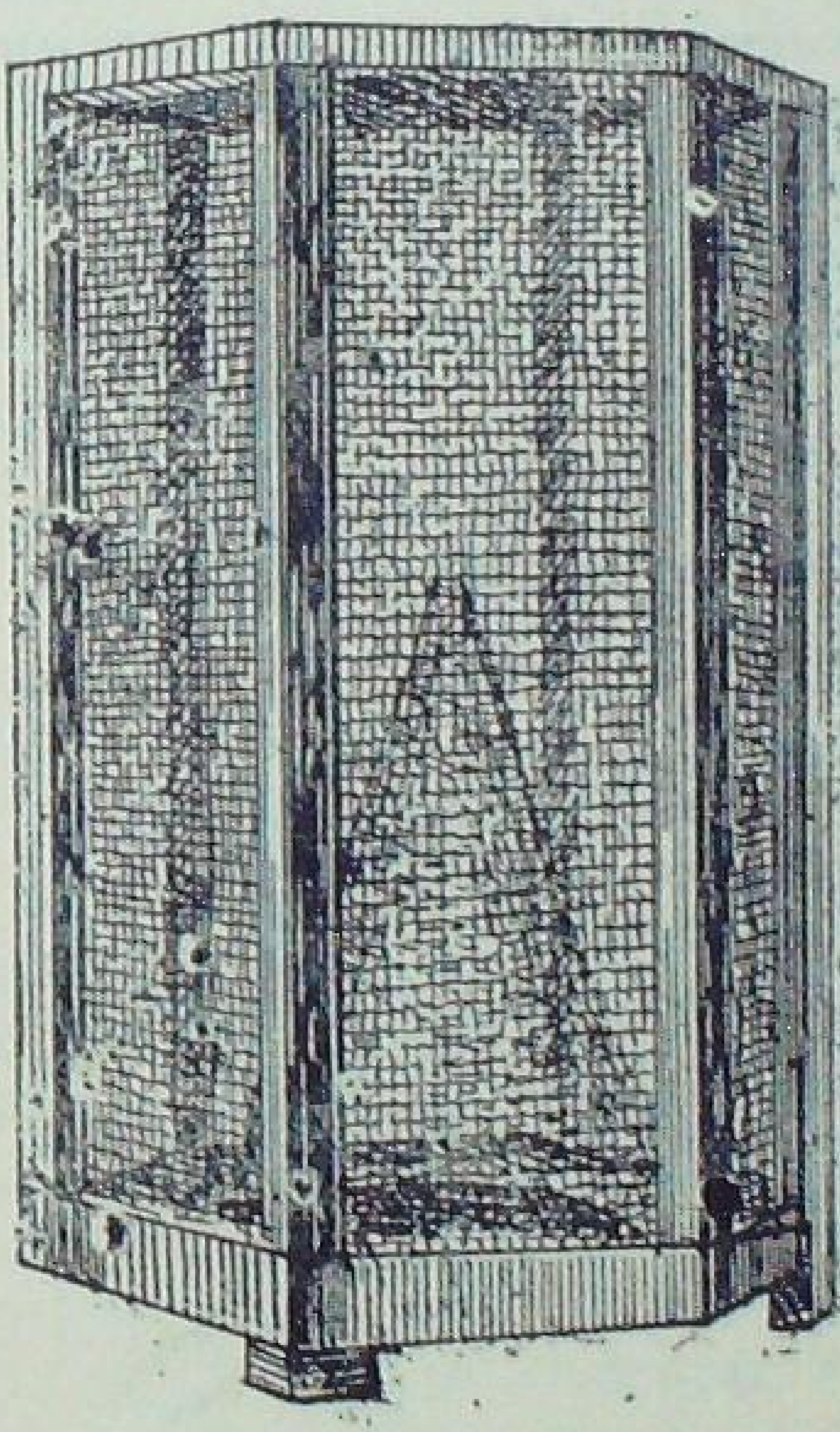


Fig. 16 Fly-Trap
"Minnesota"

Suitable baits such as highly flavoured fruits like the jack fruit, fermenting banana, or pine apple, fish molasses etc., are placed in a saucer below the large lower opening of the cone. Flies attracted by the odour of the bait feed upon it and then crawl and fly upward to the small upper opening of the cone, through which they pass out into the cage from where they cannot escape.

In the case of the jack fruit bait the sticky material of the fruit fixes them on the bait itself. The whole cage can then be immersed in water, which drowns the flies.

(3) Finally, it will of course help materially to control fly-borne diseases if human excreta and food are properly protected from access of flies by tightly constructed

and also by the tendency of such blocked fleas attempting to feed on as many rats or men as possible and on the length of life of these fleas.

Xenopsylla cheopis is the principal transmitter of plague in India. The life of these fleas being entirely dependent on the existence of rats, and as rats form the sources of infection of fleas with the plague bacilli it is evident that rat-destruction is the main method of plague-prevention.

E. TICKS (Fig. 18).

Ticks are external parasites commonly seen attached to dogs and other domestic animals. The body is not easily differentiated into a head, thorax and abdomen as there are no constrictions nor any demarcations between them. Hence the whole body is one mass with a head not clearly recognisable. The mouth-parts serve to pierce the skin of the host for blood-sucking and also to hold on to the host. Ticks have four pairs of jointed legs in the mature stage, and in the immature stage only 3 pairs. They lay innumerable eggs from which tiny ticks hatch out. The young ones are exactly like the parent forms, but have only 3 pairs of legs instead of four pairs.

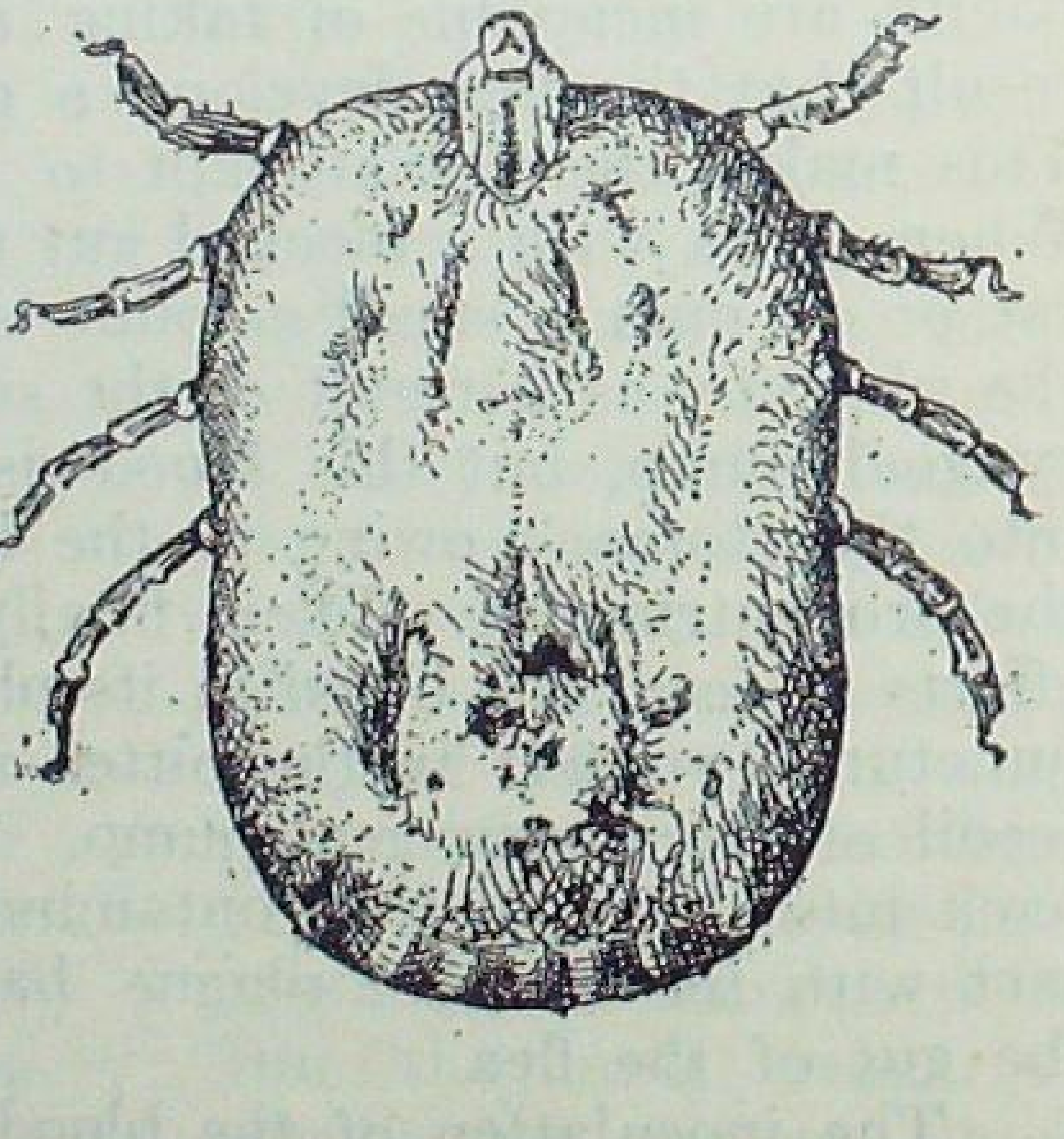


Fig. 18—Tick×50

There are two kinds of ticks, known as the hard ticks (Ixodinoe) and the soft ticks (Argassinoe). The former are the ones usually seen on dogs and animals, while the latter are less frequently seen. This is due to the habits

The Expectant Mother & Her Child

weight of the uterus has reached more than 2 lbs., while its capacity has increased over 500 times.

The rapidity or intensity of these changes, it must be said, is only exceeded by the subsequent reversal of the process, the involution of the uterus (or its return to the original size and weight) after delivery, when the normal conditions are restored in fewer weeks than the number of months required for the full growth of the pregnant organ.

It is customary to consider that the duration of pregnancy is 10 lunar months of four weeks each, that is 280 days, counting from the first day of the last menstruation. In practice, however, we find that considerable divergence from this period is often met with.

The predominating characteristics of the uterus in pregnancy are: (1) its enormous capacity for distension as in cases of multiple pregnancy, hydramnios (presence of excess of the amniotic fluid in the uterus), and (2) retractability or the power to close down promptly) as the cavity diminishes in size after delivery (when the foetus and the placenta have been expelled). (3) The most significant alteration in the uterus during pregnancy is the susceptibility of the organ to infection. It is no exaggeration to state that it is almost impossible to infect a non-pregnant uterus. Even the gonococcus (the most virulent type of micrococcus) migrates from the vagina through the cervix (or neck of the uterus) to the Fallopian tubes situated at the fundus or top of the uterus one on either side affecting only the mucous lining (endometrium) of the uterus. With the advent of pregnancy the organ becomes unusually prone to invasion by pyogenic (pus-forming) microbes, as is demonstrated in the severe septic infection which generally follows crude attempts at producing criminal abortion.

As pregnancy advances certain symptoms are liable to be produced by the pressure of the growing uterus on the neighbouring organs, such as the urinary bladder in front and the rectum behind. Hence frequency of urination occurs especially about the 4th month of pregnancy (when the bladder is compressed by the early growth of the uterus prior to its rise into the abdominal cavity); and

period of stress and strain and that but few women pass through it without more or less functional or even organic disturbances. By judicious and timely advice, therefore, regarding the details of hygiene of pregnancy much can be done to obviate such disturbances and prevent them from developing and constituting a serious menace to health. Luckily most of our pregnant women especially the educated classes do really take an intelligent interest in their welfare, particularly regarding diet and general hygiene, and as a rule all women do naturally develop during pregnancy a peculiar form of receptive mind, so much so whatever advice their medical attendant may give them regarding their condition of pregnancy is meti-culously followed by them; and women who have hither-to paid little attention to the common Rules of Hygiene do, during pregnancy with a little judicious guidance form habits of general cleanliness, habits of sleeping with win-dows wide open, of eating good food, taking care of their teeth etc. These habits formed during pregnancy may, however, be continued to their benefit throughout the rest of their life-time.

Owing to its concern with the start of a new genera-tion the hygiene of pregnancy holds a key-position in all our efforts to promote national health and national sta-mina and secures the maximum number of new lives at the minimum cost in loss or damage to the mothers, and to give a fair start to those new lives.

DIET

Physiologists universally agree that the diet of the pregnant mother has no influence whatsoever on the child's weight and that there is no correlation between the weight of the child and the gain in weight by the mother; but, there is no doubt that a generous diet in pregnancy increases the probability of a successful lactation after delivery. Hence it may be said that provided the diet is already a generous one no modification of its quantity is necessary in pregnancy.

It is important that the expectant mother should not indulge in every caprice of appetite, commonly showing

tight clothing loosened. Towards the end of pregnancy rest periods will have to be more frequent.

Sleep. There should be at least 8 hours sleep every night in an airy room with open windows. The bed clothes should be as light as is compatible with warmth. If possible she should have a room herself.

Labour is often described as the hardest muscular effort a woman is likely to perform, and it is but reasonable that preparation and training for this ordeal would help her to make the most of her powers, to conserve her energy and avoid fatigue by relaxation and rest when action is not required.

Rest should include mental rest as well and pregnancy should be made as pleasant an experience as possible, so that the woman's safety and comfort are not interfered with thereby.

BATHS

Regular bathing in addition to its hygienic advantages has a tonic effect and promotes a sense of well-being especially if followed by a brisk rub-down. Massage of the abdomen should especially be avoided in pregnancy.

In the last two months of pregnancy a daily wash-down is to be preferred to the tub-bath, as with the latter there is some danger of the bath-water getting into the vagina where it might be a potent source of puerperal sepsis. Sea-bathing may be indulged in during the early months, unless there is some reason to forbid it, but in the last half of pregnancy it is unsafe.

TRAVEL

Speaking generally, travelling is safe during the first half of pregnancy, but in the later months it should be as much restricted as possible and always at the time corresponding to the monthly periods. Sometimes journeys cannot be avoided, but every woman must be a law unto herself with regard to them. Long journeys are however, not advisable in the last four weeks of pregnancy, nor at any time if there has been a tendency to miscarriage. So much depends upon the degree of comfort with which the

At the onset of labour the patient should receive a full bath and a soap and warm water enema. An empty rectum facilitates labour, so also an empty bladder. An empty rectum also lessens the likelihood of contamination of the genitals by faecal matter during the actual expulsion of the child.

The use of a vaginal douche before labour and the use of drugs like Ergot and Brandy, which is the common practice to use among our people should be left entirely to the midwife or obstetrician in attendance. We are not in favour of the routine use of Brandy in every case of labour, unless there is an absolute need for it in the opinion of the obstetrician.

5. THE PUERPERIUM OR THE LYING-IN STATE

This is the name applied to the period during which the woman (the puerpera) is recovering from the effects of pregnancy and delivery. Strictly speaking it lasts from the completion of labour until the completion of the uterine involution or the return of the womb to the size of the non-pregnant state, which means about 6 weeks. In common usage, however, the term means the time the woman remains in bed, and is considered to end as soon as the lochial discharge ceases, that is to say, about 10 to 14 days. During this period the maternal organism is recovering from the changes which occurred in it as a result of pregnancy and labour, and the future well-being of the woman demands that this process of repair should be carried out in a normal manner and should be complete.

Involution of the uterus is the most striking phenomenon of the puerperium. Immediately after delivery of the placenta (or the after-birth) the uterus may be felt as a firm ball, extending about 5″ above the pubes due to contractions of its muscular fibres; the true involution process starts with this contraction although it does not become evident for at least 2 weeks.

The effect of involution of the uterus is, then, to bring about a gradual and marked reduction in its size and weight, and the process can be said to be complete in 6 to 8 weeks' time, when the uterus reaches back to the normal

have been proved to be aseptic or free from bacteria; and accordingly in all cases in which bacteria are subsequently found in the genital canal the presumption is that they must have been introduced from without through unclean fingers, unclean instruments and dressings, or through decomposing lochia on the vagina and bed clothes. Hence if the lochia becomes fetid or the involution of the uterus does not follow the normal course the vagina should be douched twice daily if necessary with an antiseptic solution; the most suitable fluid is either sterilised normal saline (four drams of sodium-chloride dissolved in 4 pints of water) or solution of lysol (4 drams to 4 pints of boiled water) or solution of cyllin (2 drams in 4 pints of boiled water). Lysol has the advantage of containing soap which increases its cleansing property and acts as a lubricant. All solution for vaginal douching should be sterile, used warm and in sufficient quantity; the douche can should not be placed higher than 2 feet from the level of the pelvis.

It must be understood that a vaginal douche given within the 2nd or 3rd day of delivery is practically a uterine douche, as the cervical canal is then practically patent and fluid might gain access to the uterus from the vagina.

In all cases of puerperium, we repeat, even in normal cases it is advisable to have a skilled nurse or midwife in attendance so that any small complications may be discovered, set right in time or brought to the notice of the medical attendant. She will also be attending to the cleanliness and comfort of the new-born infant. This means so much of rest and sleep to the mother, which, as we pointed out, is an important factor in her recovery from the exhaustion of pregnancy and labour.

6. FEEDING OF CHILDREN

A. Breast-feeding

It may be briefly stated that when there are not sufficient contra-indications the baby should be breast-fed. The greatest argument put forward for the practice is that

We, therefore, recommend this Wheat and Ragi mixture in the case of all babies from their 5th month onwards as it is the cheapest, most easily prepared, easily digested and adequate in respect of the mineral salts essential for growth, and when supplemented with fruit juice and Cod Liver Oil the least constipating.

Arrowroot, cornflour, sago are useful forms of starch, which may be given in the form of pudding, but they possess no advantage over rice (especially the hand-pounded parboiled) and it must be remembered that they are practically *devoid* of proteins.

Sources of Vitamins. Vitamin C. The anti-scorbutic Vitamin C as contained in cow's milk is in very small amount and is easily destroyed by boiling. It is contained in various other foods also but to a very little extent. So, in order to ensure adequate amounts the diet must be usually supplemented by some material rich in this vitamin. The substances almost universally used are orange juice and tomato juice. The juices of other citrus fruits are of value also, but either orange juice or tomato juice is economical, as these fruits are available in almost every locality.

Orange juice may be begun as early as the 8th day of birth of the infant in amounts as large as quarter to half an ounce and increased to 3 or 4 ounces by the end of the 1st year. A half-ounce daily is adequate for protection from scurvy for the first two or three months, and after that an ounce is sufficient, though more may be given. Orange juice may be given by itself or diluted with water and sweetened with sugar if necessary.

Fruit juice is a good laxative and antiscorbutic (preventive of scurvy). In our Tropical climate Nature yields a variety of fruits rich both in Vitamin C and nutrient sugars, which do count much in Infant's Dietary. Lemons, sweet-limes and mangoes have particular seasons in the year. The tropical fruits, papaya and plantains are in season all through the year; both kinds are rich in Vitamin C and sugars; papaya contains in addition Vitamin A and a digestive ferment—papain allied to pepsin of the gastric juice concerned with the digestion of proteins. It is a good liver stimulant and laxative.

Boiling, however, has its disadvantages; they are:

(1) Boiling destroys some of the vitamins, such as Vitamin C from the milk; but this is of no consequence whatever, since the loss can be easily made good by the administration of fresh fruit-juice and Cod Liver Oil.

Boiling for a short length of time actually destroys less vitamin than "pasteurisation" in which process the milk is kept at a lower temperature but for a longer period.

(2) Boiling alters the taste of milk. Adults may often object to this, but babies do not.

(3) A boiled milk is not the *natural* food of the baby as is obtained from the mother. This criticism is unreasonable, as Cow's milk itself is not the normal food of the human baby and should not be taken raw; and meat also is not taken raw.

The disadvantages of boiling are never therefore real and the advantages do certainly outweigh them.

The milk should be just brought to the boil and then cooled rapidly by placing the vessel in cold water. This still further diminishes the risk of destroying the vitamins. The milk should always be *thoroughly cooled before being set aside* for later use, as warm milk being an excellent medium for the growth of bacteria soon turns sour.

Pasteurisation consists in quickly raising the temperature of the milk to 62·5°C (145°F) maintaining it at that level for *half an hour* and then rapidly cooling. If carried out in this way pasteurisation destroys all disease-producing germs including Tubercle bacillus. A convenient Home Pasteuriser consists of a metal cruet or stand on which bottles nearly filled with milk and corked are arranged. The whole is kept in a covered vessel nearly filled with water. The water is brought to 62·5° C and maintained at that temperature for half an hour. This is a convenient method of preserving milk in a safe condition for use on journeys.

7. THE TRAINING OF CHILDREN

Childhood is the time for training in the use of their intelligence as habits of living are then formed and habits

TOWARDS A HAPPIER LIFE

HOME DOCTOR FOR INDIA

BY

M. A. KAMATH, M.B. & C.M.

Madras Medical Service (Retired)

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chapter (Part Fourth) is a very important one for expectant mothers to prevent Maternal and Infantile mortality which at present in India are absolutely abnormal, and unless checked early by diffusion of full knowledge on the subject would be a standing menace to civilisation and social well-being. This subject should be taught to girl-students in higher forms in all schools.

I am sure the public and specially the coming generation of boys and girls would be greatly benefited by a study of this admirable book and the knowledge garnered would enable them to plant their feet firmly on the road "Towards a Happier Life."

Mangalore

B. Rama Baliga, B. A., M. B. & C. M.
Retired Selection Grade Civil Surgeon
Madras Service.

TO THE READER

The main base-work of the book is a number of disjointed lectures given by the Author from time to time at the periodical celebrations of the Health and Baby Weeks in the various places where he served as the Medical Officer; and although the book is intended to be read as a whole each article can be said to be so far complete in itself. As a result of such an arrangement it will be found that we have repeated ourselves on several occasions. We trust, however, that these repetitions will serve as an advantage to the reader rather than a drawback.

An eminent educationist and kindly friend and critic, who had the goodness to glance the manuscript remarked that the book has been written in a clear and concise manner, but that the general style of expression is rather dogmatic. We admit we had to be dogmatic in some respects for the reason, that the book is meant for the layman and as such, no debatable or moot questions of Science could be raised or discussed about, as such a thing would tend to divert his attention from the main issue. Moreover, the Author's several years' experience in teaching Medical Students has convinced him that the most impressive method of teaching is by being precise and by being dogmatic in one's assertions.

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therefore, a better and more nutritious article of food than white bread, and the slogan was often heard during the last War that "the whiter the bread the sooner one is dead." The paddy should be pounded by hand-labour as milling and polishing destroys and separates the pericarp, which contains the nutrient elements like Ca and P salts, which are so essential for the building up of nerves and hardening of bones and teeth.

Beri-beri, a form of muscular paralysis due to affection of nerves, is very common among the population accustomed to the use of polished rice. In fact the disease is endemic in some parts of the Northern Circars, where parboiled polished rice is the staple food. The nerves are practically deprived of their nutrition and paralysis is the result. It is a fatal disease death resulting from failure of the heart from the nerves of the heart itself becoming paralysed. A free supply of fresh rice—washings, (not the gruel of boiled rice) does generally improve these cases. In fact this is the main article of food given to beri-beri patients in hospitals and medicine is only of secondary importance. Vegetables should be cooked with just enough of water to prevent scorching, they should be "stewed in their own juice", so to say, to retain all the salts, which are necessary to improve our blood. Fresh fruits and fresh greens contain alkaline salts and vitamins which are essential for their cleansing and cooling properties. Their habitual use prevents constipation and the long list of ailments associated with it. Rickets and Scurvy are the two other diseases due to deficiency of salts and vitamins in the dietary. Vitamins, however, at least one of them Vitamin C, are apt to be destroyed by cooking or "tinning", and this is the reason why some advocate the use of fresh, rather "unfired" food like salads, nuts and unstewed fruits.

Peas and beans are richer in proteins than the cereal grains, but their proteins are poorer in biological value than the animal proteins, as contained in milk, eggs and meat. The food-value of nuts is considerable as most of them are rich in proteins and richer in fat.

Coffee and tea are later introductions into our dietary

spread prevalence of conditions associated with the state of subnormal nutrition. Under the circumstances the urgent need at present appears to be the formulation of methods by which the production of "protective" foods can be greatly increased and their consumption encouraged.

At a joint discussion on "Nutrition in relation to human beings, farm live-stock and crops" held at the Indian Science Congress, Hyderabad on 4th January 1937 with Col. Olver, Animal Husbandry Expert, in the chair, several suggestions were made to improve both the quality and the quantity of the Indian Dietaries.

Colonel Olver, in summing up, said that the main point which appeared to have been clearly brought out was that a larger proportion of "protective" foods of animal origin was essential in order to improve the diet of the people of India. The great importance of an increase in the present consumption of milk had been strongly emphasised by almost every speaker and it seemed clear that far more attention needed to be paid to dairying than had been the case in the past. His own view was that a better balanced system of agriculture was the only feasible way in which a greater and cheaper supply of milk could be secured.

By obtaining the greatest possible return from the land such a system would enable the ryot to make money from milk or ghee and provide better food for his family. At the same time, it would enable him to produce better working bullocks and more and better farm-yard manure, and would increase the return from crops. An increased and cheaper supply of milk and better work-animals could thus be produced on every holding of reasonable extent. The feeling of the meeting had in fact been very clear that in order to provide a satisfactory diet for the people of India it was essential to do everything possible to increase and cheapen the supply of milk and dairy products. They also recognised the absolute necessity for keeping the cost of the diet as low as possible, but up to the present it had not been found possible to replace the protective foods of animal origin by the cheaper vegetable foods. Thus skimmed milk was recognised to be the best and cheapest

about 7 p.c. Another significant fact is that, whilst in England women have lower mortality rates than men at all ages, in India the female death-rate exceeds that of the male during the reproduction years, 15—40.

and this is a clear indication of its unwholesomeness, which means that it should not be used for human consumption.

Part of the rain-fall becomes "the surface" water flowing off in the rivers and lakes and ultimately to the sea; other part of the ground water sinks into the subsoil and finds its way slowly by an underground route to the bed of the nearest stream. It is this sub-soil water that we tap when we drive a well or when we find the water of a spring gushing from the side of a hill, whose slope has cut through a water-bearing stratum.

In seeking for the water supply of a town we may turn either to surface or to ground-water sources. Surface waters are obtained either from natural reservoirs of lakes or artificial reservoirs formed by damming a stream flowing through a suitable valley; ground water supplies may be obtained from springs or wells or filter-galleries; these last are really large wells dug out near the bank of a river to intercept the groundwater flowing through the soil towards the river-bed.

While the water of a running stream is more or less exposed to fresh pollution from its banks, it is at times of heavy rains or melting snow that surface waters get the most dangerous pollution. So constant is this phenomenon that the seasonal prevalence of epidemics of Infantile diarrhoea, cholera or typhoid fever is a reasonably clear indication of the part played by water supplies in the causation of disease. Great care should, therefore, be taken in choosing a clean source of water-supply and in protecting the water from contamination before it reaches the consumers. The most dangerous contamination is from sewage and human excreta, other sources being from animals and from the disposal of waste water from houses and factories. Hence, surface water from cultivated lands, river water to which sewage might gain access and shallow-well water are very dangerous. Spring water and deep-well water are wholesome and are also palatable.

Unfortunately in the case of water, as in many other things in this world, appearances are deceptive and the clear sparkling appearance of a water or its agreeable

thus wasted. It is also not suitable for cooking and in industries. Often the magnesium sulphate present in hard water gives rise by constant use to gastric or gastro-intestinal troubles. When the hardness is due to carbonate of Ca. and Mg. (kept in solution by the CO_2) it is called "temporary" hardness, as it can be removed by boiling. But when the hardness is due to presence of sulphates and chlorides of Ca. and Mg. in solution and not dependent on the presence of CO_2 and therefore not removable by boiling, the hardness is known as "permanent" hardness. Permanent hardness can be removed only by the addition of freshly burned lime to the water in the proportion dependent on the degree of the hardness; roughly about 6 lbs. to 100,000 gallons of water. (This is the proportion used to remove the hardness of the Thames water).

Alum is often used in the purification of water on a large scale. It acts by combining with alkaline carbonates and forming aluminium hydrate, which being colloidal and insoluble forms a flocculent precipitate; when this settles down it entangles with it suspended impurities and bacteria, which also settle. Alum, therefore, has a clarifying effect on muddy water; it has no effect however on bacteria of disease except in strong solution. The amount of alum generally necessary is about 5 grs. per gallon of water.

Chlorination is a valuable method of purifying impure water and rendering it safe and is best suited for the water supply of armies, barracks and jails. Certain town-supplies are also rendered safe by chlorination. Water can be chlorinated by the passage of chlorine gas or use of bleaching powder and its substitutes like "perchloron" "caporit" etc.

Chlorine Gas. The use of chlorine gas is the best and surest way, but requires an expensive and delicate plant to carry out and is therefore suitable for large towns and installations in charge of expert engineers.

Bleaching Powder. This is a white powder having a chlorinous smell and used for bleaching cotton and vegetable colours. It is unstable and yields free chlorine when

soil the surface of the Earth would have long become clogged with organic refuse and man's existence would not have been possible.

The pathogenic bacteria contained in the soil are, however, much fewer than the saprophytic, as they do not find a suitable medium in the soil for their growth and multiplication, and they die also in the struggle for existence with the saprophytes. But the soil does, however, contain certain bacteria (pathogenic) such as those of Anthrax, Tetanus, Malignant Oedema, etc., which being spore-bearing are more resistant against adverse conditions such as drying, heat etc.

Although few pathogenic bacteria can actually live in the soil for a time, a soil polluted with human and animal excreta, urine or sputum may come to contain the specific microbes of Typhoid, Dysentery, Epidemic Diarrhoea and Cholera and give rise to these diseases from infected or polluted soil through the medium of water, dust, flies etc.; certain vegetables grown on a polluted soil may communicate, if eaten uncooked, the ova of various intestinal worms, hook worms and round worms from the soil to the consumers. Some forms of tape-worms pass part of their life cycle on or in the soil.

A damp soil is, as a rule, unhealthy and when permanently wet contains much decomposing organic matter. It is a well-known fact that the general health of a community living near a damp place is much lower than the health of one living near dry places. They are prone to get diseases of the lungs and perhaps water-borne diseases also and malaria and filaria (mosquito-borne diseases). Rheumatism is very common in damp places.

For the same reason a "filled" soil or "made" soil, as is produced when tanks and low-lying places are filled up with refuse matter, is very unhealthy as both the atmosphere and the water-supply are likely to be polluted thereby and consequently the health of the inhabitants suffer greatly.

3. SUNLIGHT

Biologists have shown that solar radiation has been the most powerful environmental factor in the evolution of

that this great principle should be debarred from most of our women and children, especially those observing the purdha-system. Again, in our large cities great number of people are herded together in houses which are crowded and dark with stagnation of air. Rickets and Tuberculosis are, therefore, very common among such people as among the slum-dwellers.

Light for Reading. For reading work the sky shine obtained through the windows opening on the northern side of a building is generally to be preferred. Seating in the house should of course avoid the need of openly facing a sunny window and thus being exposed to direct glare. Shades and window curtains should be so chosen and arranged in our sleeping rooms that the early morning light can be properly controlled and prevented from waking or producing headache in those sleeping. The tendency to shut off all sunshine from the home for the purpose of preventing coloured furnishings from fading is one which from the health point of view should be combated.

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the provision of properly constructed privies.

The privies should be built on a raised impervious base and should be so constructed as to keep off rain but not shut out sunlight; the flooring should be cemented to facilitate cleansing and prevent pollution of the soil through soakage; separate receptacles should be provided for night soil and urine and washings, so as to keep them separate to prevent fermentation and facilitate their removal.

Several varieties of latrines are in use, and they do not call for a description here. But the most satisfactory type of them suitable for rural areas, for tea gardens, during fairs and festivals are the "Trench latrines," which are made by digging long trenches 8 or 10 inches wide and 1 to 2 feet deep. The person using it places one foot on either side and squats in such a manner that the solid excreta, urine and ablution water falls directly into the trench. They should be properly screened and partitioned if necessary; and should be filled up with the excavated earth when they are sufficiently full.

The final disposal of excremental matters, night soil and the urine is effected either by "trenching" or incineration in places where there is no water-carriage system. In the case of "trench" latrines the trenching is done *in situ* without having to remove the excreta to a specially made trenching ground.

A trenching ground is a plot of land where the night soil is disposed of by burying it in the soil. It should be situated outside the town and at least 1|4 mile away from the nearest dwelling house and preferably on the leeward side of the prevailing winds; the soil should be light and porous, clay soil being the most unsatisfactory. The nitrifying organisms, which are more numerous on the upper layers of the soil convert the organic material of the excreta into innocuous nitrates, which are left behind in the soil after the process is complete. It has been found by experience that a trench 2 feet broad, 2 feet deep and 20 feet long, filled with a layer of night soil 8 to 10 inches deep and closed over with the excavated earth will be sufficient to deal with 100 gallons of night soil, and that

never free from epidemics of cholera, dysentery, malarial fever, typhoid, hookworm and other intestinal worms and often times plague.

Now the principles involved in the improvement of sanitation in villages consist of:

(1) Provision of a protected water-supply;
(2) Efficient drainage;
(3) Prompt removal of refuse and excreta from human habitation.

It is therefore very important that as many latrines as are necessary should be provided in each village, and by means of intensive propaganda the villagers should be induced to go to them for calls of nature in preference to open places. The greatest impediment to the provision of sufficient latrine accommodation in villages *was* the enormous cost involved in the construction of efficient type of latrines. This difficulty is, however, now overcome by the invention of a new type of latrine, cheap and easy to construct and highly useful and clean and requiring minimum attention. It is known as the "Bore-hole" latrine.

The bore-hole consists of a round hole 14 inches in diameter bored from 10 to 20 feet deep into the ground. A re-inforced concrete squatting slab 2½ feet square, is placed over the hole, and an enclosure 5 to 6 ft. high is constructed round it. The enclosure may be of mud-walls or corrugated iron sheets or even tarred bamboo thatties. But corrugated iron-sheets look certainly smarter and are cheaper and economical in the long run.

The cost of constructing a bore-hole latrine is governed by the cost of the slab and of the labour required for the boring. On an average the cost of the squatting slab is about Rs. 3|- each and the labour for boring 15 feet is about Rs. 2|-. When the latrine fills up to within 2 feet from the ground level, which may be only in one or two years, the bore-hole should be filled with dry earth and the squatting slab removed and placed over a fresh boring made a little distance away; the enclosure can be shifted to this, and another latrine will thus be made ready for use.

most phlegmatic individual (sluggish, inactive) has his feeling and tone improved by clean clothing, though he may get apparent joy from a dirty one.

Environmental cleanliness is a highly important factor in satisfaction. This is especially true when food is related to the idea of uncleanliness. Any suggestion of dirt connected with food or food stuff brings almost a universal dissatisfaction, disgust and vomiting. The same results if cooking vessels are also unclean. Most of these emotional reactions are unsound.

It is to biological cleanliness or freedom from bacteria that health owes its greatest debt. As living microbes, as is well known, are the real causes of disease, freedom from these means freedom from disease.

The cleanliness of personal environment has equally great hygienic value. No one should use the common drinking cup; contaminated water and infected milk should be excluded, or rendered clean and free from bacteria as by boiling before use. Purification by cooking is one of the greatest sanitary advances ever made by man and is the only means of rendering a food safe for consumption.

Personal cleanliness is as important as the cleanliness of our houses, streets and places of resort. The public should be convinced of the usefulness of cleanly surroundings. This can be accomplished by proper instruction of children and adults in the technic of cleanliness based upon proper knowledge, and the knowledge should be translated into habits.

Habits of Cleanliness. Cleanliness is largely a matter of habit and is a desirable quality. Habits of cleanliness may be acquired by the passive influence exerted upon individuals by a clean environment. Children and adults forced to live constantly in unclean surroundings seldom maintain a high standard of personal cleanliness, and the first step in a proper set for the desired quality is to provide a satisfactory environment. Of equal importance with the environment are the examples set by the associates of the individual. Clean habits by the adult members of a household make greater impressions on the

Exercise, we said, increases tissue activities and heat production and stimulates the utilisation of nutrition from food and indirectly the appetite; and the increased circulation and elimination brought about by exercise influence the life of nerve cells and also improve the control of nervous and mental functions. This is a highly important factor in solving the difficult problem relating to nervous control. Hence suitable exercise does not only improve the body but the mind also, the brain becomes alert and active; and given a good intellect the man who comes to prominence in life is the man possessed of most endurance, one who can get on in life with perhaps less sleep and can do harder mental work and for more hours at a stretch.

This is an important economic health principle to be remembered by students and businessmen alike.

Now, as most of the energy of the food is spent in keeping the body warm, exposure to cold by raising the body-heat production stimulates appetite; swimming in cold water has, therefore, greatest effect in increasing the basal metabolism tenfold. The breathing of cold air, moreover, enhances the evaporation of moisture from the mucous membranes of the airtubes, the greater evaporation occasions more secretion from increased circulation of arterial blood through the membranes, and this means their better cleansing and improved resistance to infectious disease. In these facts and exposure to sunlight lies the success of open-air treatment of all lung troubles especially Tuberculosis.

Experience has shown that children, who live and sleep in the open air and are wellfed, clothed and exercised do not suffer from lung and other complaints, which children who live mostly indoors usually suffer from.

While seabathing and open-air life exert most potent influences on health a holiday at the seaside spent mostly indoors at cinemas and dances cannot be efficacious. Not only does cold moving air brace up the skin and so the whole body, but the sun acting on the naked parts enhances vitality.

Exercise should be adapted to age, sex, occupation, climate and the individual himself. A great number of

viz., hygienic school buildings and a high standard of personal cleanliness on the part of the teachers in promoting healthy habits among the children. This deserves better attention on our part and especially on the part of the teachers than has been so far bestowed.

As for the teaching of Hygiene in schools, what is actually done is just on a par with the other class subjects, and no attempt is made to impress on the children that Hygiene is solely concerned with how they should live, their personal cleanliness, their habits etc., and that it is of greater importance to have clean bodies and good physique than to simply secure a pass in the class examination on the subject of Hygiene.

In these days when War is threatening us from all sides, the teaching of First Aid to the Injured should be insisted upon in all schools. Unfortunately, very little interest is taken in this subject even by the teachers themselves. The importance of a knowledge of this subject cannot be ignored; even in normal times such a knowledge is of inestimable value in saving many a precious life by timely aid and on the spot before the arrival of the doctor. And although it is generally agreed that a little knowledge is a dangerous thing, it may be said in favour of First Aid that even the least knowledge has saved many a life, and that it is ignorance that can be said to be really dangerous.

The teachers themselves should, therefore, take hold of the earliest opportunities afforded to them to learn the art of First Aid and thereby set a practical example to the taught.

4. REST AND SLEEP

Rest is necessary after physical and mental exertion and is secured in varying degrees of completeness by reducing or moderating the pressure of one's physical, mental or social activities.

A change of activity also can secure rest; the escape from monotony, the relief of one set of muscles by the use of another set, changing from one sort of mental activity to another or the transfer to a new and more

hatred and revenge after retiring. The sleeping apartment should be dark but well ventilated and as quiet as possible. A tepid bath before retiring quiets remarkably nervous excitement and removes physical fatigue. Avoid a heavy meal and abstain from drinking too much water before retiring. Many nervous patients are benefited by engaging in deep breathing exercises just before going to bed. Last, but not the least, avoid smoking, tea and coffee and liqours. A great psychologist has suggested that we give our minds a "mental bath" every night before we attempt to go to sleep; that is, we erase from our minds everything unpleasant and disagreeable. All jealousies and envies, every unkind thought and vengeful feeling; in fact, we should go to bed with "a conscience void of offence towards God and towards man."

5. CLOTHING

Clothes have entered into the very core of our existence as social beings, and there is a general agreement upon the fact that clothing is used for three main purposes —of decoration, of modesty and of protection. The impulse of modesty and the urge for decoration even though frequently conflicting have contributed much to our present attitudes and habits with reference to clothing. It seems clear that in some ways these two motives are opposed to each other; for, the essential purpose of modesty is to hide such excellences of body as we have and refrain from calling the attention of other people to them; while the essential purpose of decoration is to beautify the body so as to attract the admiring glances of others of the same sex or of the opposite sex. It would seem impossible to satisfy these two contradictory tendencies by means of clothes. However, the tendency for both display and shame are attached not to the clothed body but to the naked body.

The decorative uses of clothing are many and varied. The one given the greatest prominence is sexual. Primitive clothing and decoration started at or near the genital region and frequently related definitely to some sexual occasion, such as puberty, marriage etc. The modern

shoes with narrow tips though very stylish in themselves are not comfortable and interfere with walking and cramp the toes on each other. In-turning of the nails of the toes is always due to the use of narrow tipped shoes. Tight hats, stiff collars and neckbands are also harmful if they do not fit properly.

Force of fashion in dress. Fashion is said to be a mysterious goddess whose decrees it is our duty to obey rather than understand; one may either be a worshipper of fashion or a scoffer, neither attitude becomes the scientist. So we enquire why fashion exists and what are its influences on humans from the hygienic standpoint. The ultimate and essential cause lies in social and sexual competition. Born of an innate desire for the recognition of superiority it has become an economic as well as psychological problem. The desire to be equal to our fellow men leads to imitation at any cost. Lower social ranks seek to move away from their former position. This operates on the community as a whole and on each individual.

Commercial organisations recognising these facts have built up immense interests for mass-production and rapid and frequent changes in style. The tempo of life leads to acceptance of rapid change expressing itself in changing tastes in clothing. Our fear of not being up to date does the rest even at great sacrifices.

In certain types of people to be denied clothing according to the prevailing fashion is sufficient to cause reactions that spread their influences to almost any system in the body. Fashion may cause the individual either to overdress or to go without sufficient dress to the detriment of his health.

In certain mental states fashion in clothing is a most important consideration in adequate treatment.

Spencer has wisely said "a consciousness of being perfectly well dressed may bestow a peace of mind such as religion can·not give." So the individual, be he a child or adult, who is made to feel a sense of inferiority on account of clothing not in keeping with his own social position has a serious source of psychologic irritation. The results are often far-reaching.

marital act or pregnancy or child-birth.

(2) When the person is suffering from a disease likely to be transmitted to the spouse or children, such as, syphilis, leprosy etc.

(3) If the person is suffering from an actively infectious disease like Tuberculosis, marriage should be strongly protested; but whereas in the case of epileptics or diabetics there is no risk of infection and some of the children may escape the transmission it is advised against marriage on the ground that some at least of the children would almost certainly inherit the disease.

(4) In the case of epileptics, alcoholics, opium-eaters, imbeciles, it is quite essential that marriage should be prohibited, as most certainly in such cases a neurotic class of progeny is the result. Gout and Rheumatism are two other conditions usually transmitted to the children, but are not necessarily contra-indications to marriage, as the hereditary tendency can be overcome by an environmental change and good habits of living.

We know the instance of a medical friend who died before the 35th year, leaving 4 children—all imbeciles, having been begotten after he contracted the habit of taking morphia, which drug he took in 3 or 4 grains doses hypodermically to give sleep at night as he was suffering from sciatica. Most of the children died before the 14th or 15th year.

8. SEXUAL ABUSE

Excessive sexual indulgence is harmful enough in adult life but much more so in youth. It gives rise to general nervous depression with mental and muscular weakness and results in premature loss of sexual power, premature old age and often melancholia and other mental disorders. Sexual abuse in the married is the result of ignorance of its bad effects; in the young and the unmarried it is often encouraged by obscene literature, bad company and the lures of prostitution. This is one reason why it is advocated that even young children should not be denied knowledge about sex matters. In fact children cannot be brought up in ignorance of sexual matters and

Alcohol may, however, indirectly cause obesity; first, by increasing the appetite and favouring over-eating, and secondly by "sparing" the tissues especially fatty tissue, as the oxidation of alcohol in the body lessens the need for the oxidation of fats or carbohydrates. Thus, fat is spared to be stored as such, or the carbohydrates spared to be converted into fat.

When alcohol is absorbed its "concentration point" is reached in the blood within a short time. Now, the degree of intoxication depends upon this concentration in the blood at the time, so that if a person intends to consume a large quantity of alcohol whether in search of pleasure or of energy, but is at the same time particular in minimising its intoxicating effects also, he could do so by adopting certain means that will delay the rate of absorption. Now the chief factors known to retard the rate of absorption of alcohol are:

(1) The presence of food in the stomach, especially such foods as milk, bread and fatty substances; and (2) Dilution of the alcohol. Hence even the mildest of alcoholic intoxicants taken on an empty stomach produces maximum effect. Hence the usual practice of starting a meal with a high content of oils or fats such as soups before the "drink" is conducive to the retention of a "discriminating palate" throughout the course of the meal.

The quantity of alcohol required to produce its intoxicant effects varies enormously according to its dilution and strength, the previous habits of the individual and his idiosyncrasies (individual susceptibilities); and, as pointed out above, on the presence or absence of food in the stomach at the time of drink and the degree of concentration in the blood.

Ordinarily about 2|3 ounce is sufficient to produce detectable amount of inco-ordination (reeling etc.) and a blood-concentration of 0·15 p.c. is about the order of concentration that corresponds with "drunkenness" in a person *not addicted* to alcohol. The degree of intoxication, then, depends upon the blood-concentration so that "lethal concentration" may be said to have been reached when alcoholic "stupor" has set in.

Alcoholics are, therefore, as a rule weak-minded and fall an early prey to the drink-habit itself. Drink, then, predisposes to feeble-mindedness, and feeble-mindedness in its turn leads on to the drink-habit, a sort of vicious circle is thus established.

Alcohol, thus, produces a deleterious effect on the mental powers also. It is said that Prof. Huxley, the great physiologist who was not a total abstainer and might have therefore been friendly to the effects of drink, was once asked if he found alcohol a brain-stimulant; to which he replied, "when I have to do good or original brain-work I always decline to have it, I become a total abstainer for the time being."

Employers have long recognised that the habitual use of alcohol by workmen lowers their efficiency, and the recognition of this fact has led employers to draw up rules prohibiting the use of alcohol during the working hours; others have gone further even to the extent of refusing admission to those who take alcohol in any form, at any time or in any quantity. This is particularly important and justifiable in employments in the Railways and other Transport Companies, where lives and safety of passengers are especially dependent on the clear-headedness of the employees.

Experiments have been carried on to test the effect of alcohol on the working capacity of workmen, which was found greatly reduced in the case of those who took to alcohol.

Dr. Richardson, who carried out experiments on himself concerning the effect of alcohol on muscular activity says: "The work that can be done during entire abstinence is superior in every respect—in respect to amount, in respect to readiness of effort, in respect to quality, in respect to endurance and in respect to mental ease and happiness."

Another experiment determined the effect of alcohol upon one's "speed" in responding to certain stimuli; the reaction-time was much longer in the case of alcoholics. Now, this reaction-time is very important when a quick decision is needed in cases of emergency, say avoiding a

Nevertheless distilled spirits were known early in the East, but came into use among the Western Nations about the Middle Ages and spread rapidly among them being considered the "water of life" (or aqua vitae, as the modern word "whisky" indicates) so much so their employment as a habitual stimulant is today perhaps the greatest evil prevailing among the civilised nations of the world, bringing about in the lower strata of the population a state of physical and moral degradation hardly paralleled in the worst ages of History.

If we should examine the question, what were the initial stages in the introduction of alcoholic appetite into modern society the answer is not far to seek. Highly spiced meat dishes of civilised cookery tend to produce an abnormal thirst, which requires something stronger than water to quench; irritating condiments are as a rule injurious to the digestive organs and are also obnoxious as creators of the liqour-thirst. There is, therefore, no doubt that the free use of condiments used with meat intensifies the stimulant effect of the extractives contained in the meat, which latter are themselves, apart from their accompaniments, stimulating to a good extent.

Viewing the subject broadly, it is well known that nations consuming large quantities of meat as food are, as a rule, also noted for an excessive consumption of alcoholic liqours, as the craving for alcohol can be overcome only with the greatest difficulty when a flesh-diet is adopted; whereas this craving loses its hold on the victim when a diet of cereals, nuts, fruits and vegetables is adopted.

India has been the home of temperance from time immemorial as her principal religions and codes of Ethics, we said, all taught temperance not only in the matter of alcohol but of all kinds of intoxicants. But today we see drink has become the commonest evil of our Country and exists not so much among the unlettered villagers (among whom liqour taking is a social stigma) as among the industrial workers and the so-called educated societies in towns and cities. The labourers took it in the absence of a recreation after the hard day's toil, whereas among the educated and well-to-do classes it was regarded as an

habit. Jane Nicot, a Portuguese, introduced it into France, and from him is derived the name, nicotine, the chief alkaloid contained in tobacco.

The smoking habit was considered dangerous and was once violently opposed by those in power, notably James I of England, The Czar of all the Russias, The Shah of Persia and Pope Urban VIII; the latter pronounced tobacco an "accursed" thing like liqour; and inspite of severe punishments like scourging (whipping) cutting off the nose etc., or even death-penalty meted out to the most obstinate smokers the evil grew apace. In England even the "thundering invectives" of James I were nothing in the face of the craze for smoking, and in one of his pronouncements he denounces the habit in these words: "It is a custom loathsome to the eyes, hateful to the nose, harmful to the brain, dangerous to the lungs and in the black stinking fumes thereof nearest resembling the horrible Stygian Smoke of the pit that is bottomless."

With all this opposition we nevertheless see that smoking has so much advanced in public favour that it has today practically the whole world at its feet. How is this accounted for? Because tobacco is a powerful narcotic having its influence on the nervous system and is an extremely deceptive drug, creating in the smoker a sense of temporary felicity, a feeling of ease and wellbeing that has no real existence. It often seems to allay nervousness when in reality it slowly and unawares breaks down the nervous system and leaves the victim a nervous wreck "as smoke clouds the intellect." Hence the popular belief "He who smokes not, may fume."

Sometimes tobacco seems to exert a stimulating effect on the brain, but this is invariably followed by a period of depression, so much so a craving is soon induced leading to a repetition of the dose with perhaps an increase in the amount also. In this respect it closely resembles alcohol. The peculiar fascination of tobacco making it difficult for the victim to give up the habit should be considered a powerful argument in itself against the use of this dangerous drug.

The chief chemical constituents of tobacco smoke are:

chewers has already been referred to and is the greatest draw-back.

Pyorrhoea is very common among chewers and is mainly due to want of proper care of the teeth in cleansing them.

TOBACCO-SNUFF

Usually prepared by drying the leaves over live-cinders until they became brittle and can be reduced to powder; next, this powder is ground down into finer powder with a small quantity of cow's ghee and dried slaked-lime. As noted above the addition of slaked-lime seems to oxidise the nicotine and accelerate its action. The nasal mucous membrane is especially prone to irritation by the constant use of snuff, and it is said, that the effect of tobacco on the eyes is sooner manifest when the drug is used in this manner.

To give up the tobacco habit. It is not a very difficult matter to give up the tobacco-habit. When the craving comes one or two lemon drops or slices of sweet fruits put in the mouth help to allay the craving. A strong will is of course of greater importance in stopping the habit.

12. PAN-SUPARI (Betel and Arecanut)

The Eastern habit of constantly chewing betel leaves with chunam, arecanut, catechu and tobacco undoubtedly predisposes to pyorrhoea alveolaris among adults, and we have already seen how the constant irritation of the mucous membrane of the mouth and the tongue by the acrid tobacco predisposes to cancer also.

Fresh betelnut (arecanut) seems to have some poisonous principle causing faintness in the user especially with some idiosyncrasy.

Tartar on the teeth seems to be specially favoured by its use.

Nevertheless, it must be said that a sparing use of betel leaves and nut but *without tobacco* after a full meal acts as a sialagogue (increases the flow of the saliva) and reflexly stimulates the flow of the gastric juice in the stomach. It thus helps digestion.

Heroin, another alkaloid of opium similar to morphine, is such a dangerous drug of addiction that its use should be allowed only under doctor's advice.

Codeine is mostly used in diabetes and irritable cough. Addiction to codeine is very rare in India.

Opium poisoning. Opium is the commonest suicidal poison used in India as death thereby is least painful. In children poisoning is usually accidental, the drug being usually employed in the form of soothing syrups (containing opium) to produce sleep in infants and many a time, the sleep that is produced "knows no waking"; opium is sometimes administered with homicidal intent also in children. Fatal dose for adults is 4 grs. of opium. Habit produces tolerance for the drug. It is said that De Quincey used to swallow 9 oz. of laudanum daily. Laudanum is Tincture of opium, containing about 32 grs. of pure opium in an ounce, so that $32 \times 9 = 288$ grs. of opium equivalent to about 30 grs. of morphine would be contained in 9 ounces. A more remarkable case of tolerance to morphine is mentioned where the individual is said to have been taking daily 40 grs. of morphia hypodermically or 80 grs. by the mouth; the usual medicinal dose of morphia being 1|4 to 1|2 gr. hypodermically. In susceptible individuals even the smallest dose of morphia or opium produces alarming symptoms.

B. INDIAN HEMP

Synonym.—Cannabis Indica, Cannabis Sativa. This hemp grows wild in the mountainous and sub-mountainous tracts over the whole of the North Eastern and North Western parts of India. The writer has personally observed large tracts of wild growth of this plant along the Railway lines between Hardwar and Hrishikesh. Its three preparations that are in common use are:

(1) Bhang—the dried leaves of the plant pressed into cakes.

(2) Charas—the resinous exudate.

(3) Ganja—the flowering tops.

(4) Majum—a sweet prepared with one of the above preparations.

perhaps one's mental attitude towards his work may be an important contributing factor in his difficulties.

(2) *Infectious Diseases,* such as even a common Cold, frequently give rise to temporary mental emotions, which are apt to occur during the period of convalescence. Colds are frequently followed by periods of increased sensitiveness and emotional depression. They are, however, temporary and are practically normal after—effects of the infections and disappear readily by proper care.

(3) *Loss of Weight* is another factor which causes mental depression. Practically 80 p.c. of depressed patients are underweight, and in many instances the under-weight may be traced to some cause existing previously to the onset of mental illness. People should understand that they cannot lose weight with impunity, and in case they discover no cause for the loss of weight they should consult a doctor in order that both their physical and mental well-being may be protected.

(4) *Periods of Physiological Changes,* such as puberty, menstruation, pregnancy, and involutional periods, such as delivery and menopause, are frequently accompanied by emotional disturbances. At the time of puberty children pass through a period which is marked by great sensitiveness. They have a tendency to fix their attention on themselves and are often confused by the increased emotionalism, which is normal during this phase of their development. Majority of women are more sensitive during menstrual periods and usually experience a few days of depression at that time. Often pregnancy also gives rise to hyper-emotional state. Such disturbances are usually of short duration, and both husbands and wives should understand their significance.

The involution-period is nearly always accompanied by mental depression, which frequently lasts for several months and which is often characterised by a tendency on the part of the persons to imagine that their condition is real. All these emotional conditions do usually disappear when the patient has passed through the particular period of physiological change. It is important that the individual so affected should understand that such disturbances

the amount and type of intellectual training which he receives and the emotional influences to which he is subjected in the course of his development. The laws of heredity undoubtedly play a part in shaping an individual's destiny, but it has been well said that heredity ceases at the time of birth and from then on, the environmental influences to which the individual is subjected are a most important factor in shaping his life and in determining his reactions to given situations. While it is true that human beings enter the world with inherent instinctive drives at the time of birth, there are relatively few specific stimuli which will arouse their emotional reactions. As time passes however, they acquire numerous stimuli which will automatically set off their instinctive forces. It is important to note that experience plays a great part in conditioning their emotional reactions.

"Conditioned emotional responses" are responsible for a major portion of certain objectionable traits of the human race. A child who had been punished while in school by the teacher who wore a black coat, for instance, might thereafter automatically be prejudiced against any one wearing a similar black coat. The baby who had been startled by the bark of a long haired grey dog was thereafter not only afraid of all dogs but also showed great fear of all fur garments as well as animals with long hair. A man who experienced an attack of fear while in a barber shop thereafter experienced fear in an inexplicable manner whenever he entered any barber shop. A woman whose only child had grey eyes felt automatically attracted to any child which had grey eyes.

The conditioned emotional reflex is responsible for many of the neuroses. This is particularly true of phobic (relating to fright) reactions. A person who experiences fear under a given circumstance often attempts to evade similar conditions in the future in order that he may not run the risk of again experiencing the discomfort of fear; some people who have experienced discomfort in theatres and crowded places may find that whenever they are in a theatre or in a crowd they are automatically assailed by an acute form of fear which they are unable to account

temporary frustration, profit by failure and courageously attempt another intelligent effort.

Failure and suffering are two eye-openers so to say, and small doses immunise the individual against greater failures and sufferings.

Sickness. All human beings have to experience a certain amount of ill health, some more perhaps than others. People must accept illnesses and treat them as a normal part of life, and comprehend that they are not going to become invalids. Illness has a tendency to fix the individual's attention on himself; this tendency must be combated as far as possible by broadening the patient's interests and giving him every opportunity to indulge in any occupation which his illness will permit.

Adultery is a very frequent cause of mental disturbances also in addition to physical suffering. The experience is often a blow to one's self-respect, which affects the mind seriously.

What is known as the *"Middle-age reaction"* is a state of mind which many people pass through between the ages of 45 and 55. It is usually marked by a fear that one is growing old, that one's usefulness is approaching the end, that the joys of life will not be as great in the future as they have been in the past, and in general with a feeling of "What is the use of trying any more?" This is a period of depression and discouragement when life seems to lose its zest.

Individuals passing through a middle-age reaction should consider that they are not seeing things in their true value since their sense of proportions is distorted. They must be tolerant, do their job the best they can, broaden their interests and wait until this phase passes, secure in the knowledge that they will soon feel better than ever and have many happy years ahead of them.

Death is an event which most people fear. It is not only an adventure into the unknown but to most individuals it connotes the final agony and is, therefore, an event to be dreaded. This fear of death often arises in childhood and is a result of the way the event is treated by the adults with whom children were associated.

COMMON CHEMICAL SYMBOLS.

Ca	...	Calcium.
Cl	...	Chlorine.
CO	...	Carbon monoxide.
CO_2	...	Carbon Dioxide (Carbonic acid gas).
Cu	...	Cuprum (copper).
Fe	...	Iron.
H	...	Hydrogen.
I	...	Iodine.
K	...	Potassium.
Li	...	Lithium.
Mg	...	Magnesium.
N	...	Nitrogen.
Na	...	Sodium.
O	...	Oxygen.
P	...	Phosphorus.
S	...	Sulphur.
SH_2	...	Sulphuretted hydrogen.

of the temperature of the surrounding air or medium. This phenomenon is an equilibrium maintained between heat-production through oxidation of food materials and heat-loss through urine, evaporation of sweat from the skin or from conduction and radiation.

3. The third function of food, *viz.*, that of regulating "the body-processes" is mainly fulfilled by vitamins and mineral salts. It is known that heart-muscle, for example, cannot contract in the absence of proper amount of mineral matter. As mineral salts are also constantly excreted from the body by sweat and urine especially, they should be continually supplied to the system through food; further, it has been found that bone and teeth, which require Calcium and Phosphorus for their healthy growth, cannot assimilate these minerals in the absence of the calcifying Vitamin (Vitamin D) in the food though they may be present in sufficient quantity in the diet.

There are certain other processes of the body which are dependent entirely on the presence of mineral matter and vitamins.

[*The Hormones and the Enzymes.* The Hormones are produced by the so-called "ductless glands," about which we shall have to speak later, but it may be mentioned here that Hormones consist of certain definite chemical compounds allied to the amino-acids, which, as we shall see later, are the products of the digestion of proteins. It is, therefore, clear that the production of Hormones by the ductless glands depends upon the presence of proteins which are capable of yielding the requisite amino-acids. Thus, the chemical formula of Thyrosine, one of the amino-acids produced by the oxidation of proteins is very similar to that of adrenalin, (the hormone of the ductless glands, the suprarenals). Likewise the recently discovered, Thyrotoxin (Hormone of the Thyroid gland) indicates its probable derivation from the amino-acid, Thyrosine.

The *Enzymes* or ferments are the chief agents concerned in the chemical transformation of food involved in the process of digestion and assimilation. The enzymes are simple chemical substances and are capable of

more easily digested and assimilated, as animal proteins are akin to our body structure; that they are more easily capable of breaking up into the various amino-acids essential for growth and repair; and that they are, therefore, superior to vegetable proteins, as the amino-acids contained in the vegetable proteins are not present in the same relative proportions as those found in animal proteins, so that when vegetable proteins are converted into body proteins there is apt to be considerable wastage, which is not the case with animal proteins, in the latter the amino-acids being more abundant. Nevertheless it has been found by experience that the best physique and power of endurance are equally possible from a purely vegetarian diet including milk and its products. Physiologists have of course offered the explanation that milk proteins of high biological value raise the biological value of the poorer vegetable proteins when mixed with them in diet.

Chevers, the pioneer Surgeon of Calcutta, whose name is ever associated with his monumental work on Indian Medical Jurisprudence, wrote exactly a century ago about the dietary of the Hindus as follows: "It is certain that the law-givers who prescribed for the people of India a diet consisting mainly of vegetables (vegetable food is meant) and water, the lighter kinds of animal food such as fish, pigeons and goat's flesh being only occasionally introduced in moderate quantity, judged almost as physiologically as they could have done had they studied at the feet of Liebig and Prout." Further, in the discussion of the dietary of man the meatless diet of some of the finest soldiers of H. M.'s Indian Army, who fought in the Great War of 1914 was highly extolled. This is an interesting subject for research in the quest of the minimum animal protein required for human consumption, and the future Scientists may show that it is perhaps influenced by climatic conditions.

B. CARBOHYDRATES

They are the chief source of energy and are essential for the characteristic processes underlying muscular

tically indigestible provides with the undigested portion of food the "roughage" or ballast to the contents of the larger-bowels, which is absolutely necessary for their daily evacuation; cellulose is, therefore a mild laxative acting on the bowels as a mechanical stimulant. Similar action on the bowels is produced by indigestible husk of grains and skin of fruits; Sea-weed agar also acts as a laxative in this manner.

It has been observed that if herbivorous animals are fed on a diet which leaves little residue or no residue they will suffer from intestinal affections; even in the case of man a diet which is practically completely assimilated is prone to bring about intestinal disturbances; on the other hand, a diet which leaves behind a very large residue is not only wasteful economically but demands for its manipulation and disposal an undue amount of muscular and nervous energy on the part of the intestines. This is one of the drawbacks of a purely vegetarian diet. On the other hand, a vegetarian diet has its own advantages: it prevents chronic constipation and intestinal "stasis" with their accompanying condition of auto-intoxication (intestinal toxaemia) from absorption of the products of decomposition in the intestines, and to a large extent diseases like sprue and appendicitis, these diseases being mostly common among meat-eaters, because the residue left by the digestion of meat is not sufficiently bulky and is more toxic than the residue of a vegetable diet. Constipation is almost the normal condition among those European residents in India and the Tropics, who still continue their native meat-diet of the temperate regions.

In conditions of disease it may be necessary to take advantage of the behaviour of different foods. In constipation, especially of the chronic type it is important to supply a large amount of ballast by giving green leafy vegetables and fruits and even articles leaving large residue such as wholemeal bread and agar. On the other hand in diarrhoea foods like rice, arrowroot, milk and bread which leave little residue behind after digestion are usually prescribed. Incidentally, such foods are digest-

been checked by providing I in the form of Potass. Iodide mixed with common sea-salt. The minimum quantity of I required daily by an average adult has been estimated at 1 upon 70,000 of a grain.

Fluorine and Silicon occur in bones and teeth contributing to their strength and rigidity.

Distribution in Nature. Calcium. Foods containing Ca are milk and its products (buttermilk, whey and cheese) Eggs, Bran, Oatmeal, Dhall, Ragi, Millets and fruits and green leafy vegetables. Women in pregnancy and lactation and growing children do require these foods very much in their daily needs. Too little calcium is the cause of the decay of teeth, of osteomalacia (softening of bones) with distortion of the limbs, rickets and certain forms of general malnutrition.

Phosphorus is contained in milk, butter milk, cheese, eggs, meat and fish, dhals, wheat, soyabeans, ragi and cholam and vegetables like spinach, radishes and cauliflowers.

Deficiency of Phosphorus interferes with the nutrition and structure of bone and teeth.

Both P and Ca should always be present in combination for perfect bone and teeth and this combination is yielded best by milk, eggs, dhals, millets, green vegetables, spinach, brussel, sprouts, potatoes and fruits (figs, apricots, almonds and black currants).

During pregnancy and lactation in the absence of sufficient Ca salts in the diet the bones and teeth of the mother are frequently drawn upon to supply this factor to the child with resulting demonstrable damage to the mother.

Calcium and Phosphorus.—It is interesting to note that the calcium-phosphorus ratio of 2 to 1 in human milk is more favourable for Ca and P assimilation by infants than in the cow's milk, where the concentration of Ca is only slightly higher than that of P. Consequently breast-fed infants are normally less likely to be deficient in Ca than artificially fed infants.

Iron (Fe) is contained in liver meat, eggs, unmilled cereals, pulses, amaranth, spinach, tomatoes and radishes,

luxury like alcohol or an intoxicant like opium or ganja, unmindful of the economic hardship caused thereby to the poor labourer.

Common salt is essential for the manufacture of the Gastric juice and the Hydrochloric acid contained therein.

The acuteness of distress caused by dwindling supplies of common salt and rising prices was once keenly felt by the poorer classes of population in C. P. and Bihar, and a serious fall in the consumption of salt resulted in serious problems of health. It has been found for instance, that fish consumed by them without an adequate quantity of salt was a source of choleraic diarrhoea in many instances.

Salt is a common preservative of foodstuffs like meat, fish and vegetables.

Salt-free diet. In chronic Bright's Disease where the kidneys are inflamed and are consequently unable to excrete sodium chloride freely by the urine, the salt taken with food is retained in the system; and in order that the normal composition of the body-fluids may be maintained water also is kept back with the result that dropsy sets in. Now if the salt in-take is reduced to nothing, in other words if no common salt is taken with the diet the salt that has accumulated in the dropsical fluid is drawn upon to make good the deficiency (of salt) in the blood and with the withdrawal of the salt the dropsy also subsides. Physicians, therefore, prescribe a salt-free diet in all cases of dropsy due to kidney disease and even diseases of the Heart and the Liver.

F. VITAMINS

It has been found by experiments that animals fed entirely on Proteins, Carbohydrates, fats, salts and water—all possessing a high degree of chemical purity, do not remain in good health; similarly it has been observed that in man the omission of certain constituents of normal diet results in disease—the so-called "Deficiency-diseases"—and subsequent inclusion of the missing constituents (or even their extracts) results in most cases in recovery. These missing substances are the 'vitamins'

The condition, Xerosis, has been thought to be due to deficiency of Vitamin A for several reasons: it has been experimentally produced in animals by withholding Vitamin A from their diets and proved to be curable by giving Cod Liver Oil or Mammalian Liver or birds' liver, which, as we saw, are rich in Vitamin A. Dr. Aykroyd, at present Director of the Nutritional Research Laboratory, Coonoor described the following observations made in Newfoundland and Labrador in the summer of 1929; the diet of a series of cases of Xerophthalmia with night-blindness was found to be obviously defective in Vitamin A; in some patients the disease developed in less than a month after the patient had passed from a diet rich in Vitamin A to one which was totally devoid of it. The condition of the country and the mode of life followed by the people made it difficult or impossible to obtain proper food. All these cases were curable, especially the night blindness by one or two doses of Cod Liver Oil. Two fishermen, Aykroyd says, had cured themselves by eating half a sea-gull's liver, and Liver is, as is well-known a time honoured specific for night-blindness, and Hippocrates, Father of Medicine in the West, recommended that "the patient should eat once or twice as large an ox-liver as possible, raw and dipped in honey".

(2) Another common manifestation of eye disease due to Vitamin A deficiency is Keratomalacia (literally meaning softening of the cornea) which consists in the softening of the cornea of the Eye and its complete destruction resulting in complete blindness. This disease is also due to lack of Vitamin A in food and occurs mostly in children after the first year of life, but may also be found in older children and rarely in adults over 20 years of age. The child usually suffers from extreme emaciation and diarrhoea, enlarged liver and spleen; there is accompanying condition of Xerosis, so much so that Keratomalacia may be considered to be an advanced stage of Xerosis. The child is apathetic and is unable to close the eyes, gradually the cornea becomes softened and peels off resulting in an irreparable form of blindness.

Keratomalacia is possibly the most serious cause of

of the students and predisposed them to the attack of Beriberi, as the rice also they consumed was the highly milled white rice devoid of Vitamin B_1. This defect, however of the rice was detected for the first time by the late Dr. M. L. Kamath, who was carrying on investigations into the causation of Beriberi at the time and who later submitted a Thesis which obtained for him the M.D. degree of the Madras University.

The anti-beriberi vitamin is a nitrogenous substance not containing Phosphorus and can be largely furnished by supplying pure dry yeast, malt extract, rice polishings or their alcoholic extract known as Tiki-tiki in Japan, where we said, Beriberi is practically endemic. To the Hospital patients both in Vizag and later in Guntur, the author used to allow 6 ounces of Toddy a day (containing a fair amount of yeast in it), green vegetables especially okra (*Bendikai*) steamed to retain the salts and salted, and staple diet of parboiled handpounded rice. Recovery usually followed within about 6 to 8 weeks.

3. *Vitamin B_2* is composed of two factors:

(1) Riboflavine, a growth—promoting factor, and

(2) Nicotinic acid, which is the pellagra preventing (p.p.) Vitamin G.

Pantothenic acid, one of the constituents of Vitamin B_2 is supposed to prevent or cure grey hair. At present Doctors have "nothing for grey hairs but the greatest respect."

This Vitamin B_2 occurs in nature usually in association with Vitamin B_1 in yeast, meat especially liver, milk and eggs, legumes, fruits, tomatoes, vegetables and whole grains.

Deficiency in Vitamin B_2 gives rise to a disease called Pellagra (=rough skin) which is characterised by certain skin lesions, soreness of mouth and intestinal and nervous disorders. There is anaemia with emaciation. Although it is now recognised that the disease is a deficiency disease it is still possible that mouldy maize may be a causative factor, as a few cases noticed by Dr. Raman in Guntur in 1932 were traceable mostly to mouldy maize, and maize forms the staple food of the

Vitamin A in Cod Liver Oil, butter, yolk of egg, whole milk, green vegetables and Liver of animals and birds. *Fish Liver oils are the richest natural sources of Vitamin D.* It has been already mentioned while discussing the importance of vitamins in general that the absorption of Ca and P salts from the food is dependent to a large extent on the presence of Vitamin D in the food. Hence, deficiency of this vitamin in diet interferes with the absorption of Ca and P salts required for growth of bones and teeth, and the bones consequently become soft and deformed as growth proceeds. This condition is rickets and Vitamin D is, therefore, called the antirachitic factor.

Now, it has been proved that one of the parent substances of Vitamin D is a substance called ergosterol, (a form of natural alcohol formed in plants), which acquires on exposure to the Sun's rays antirachitic properties. There is, thus, an intimate relation between Vitamin D and sunlight; in fact, Vitamin D is said to be generated by the action of ultra-violet rays on ergosterol. It naturally follows, therefore, that the disease (rickets) should be absent or be rare in places where there is enough of ultra-violet irradiation and it has been found by experience to be so; and infants receiving abundant exposure to sunlight as a rule do not have rickets. Hence the disease is rare in the Tropics. It is rare also in the Arctic Zone inspite of the mildness of the sunlight, due to the fact that the diet of the inhabitants of these regions consists largely of fish and fish oils, which we mentioned above are the richest natural sources of Vitamin D.

The dark skinned races appear to be more susceptible to rickets probably due to the pigment of their skin preventing the beneficial effects of the Sun's rays.

Rickets generally occurs in children within the first two years; sweating about the head, irritability of temper, muscular weakness, delayed teething are the early signs that attract the mother's attention. In the advanced state the "Rickety-rosary" formed by the enlarged epiphyses of the ribs on either side of the breast-plate is characteristic. The bones of the wrists and the ankles become thickened, the shafts of long bones become soft

quantity of the three principal elements of diet—the Proteins, the Fats and the Carbohydrates required by man for maintenance of health and efficiency. No definite agreement has yet been reached, which may be applicable to the human race as a whole. One of the reasons for this diversity of opinion seems to be, that the human body can adapt itself to all forms of environmental changes including the matter of Diet.

The quantity of food required by the body depends upon several factors:

1. *Age* is an important modifying factor; in the span of life from birth to maturity age is the greatest single factor modifying the energy needs of the body; in children as will be seen later, the tissue activities are relatively higher than in the adults, hence additional allowance should be made for this and for growth also.

In adults the total energy requirement is determined by the size of the body and muscular activity as work, and after about the 40th year when the metabolic needs are decreasing the amount of food is also correspondingly less; but with advancing age the lessened functional activity of the organs and the tissues make it necessary to adopt a suitable dietary to the energy requirements.

The danger of over-feeding in the old is almost as great as the danger of under-feeding in the young; age cannot be defied and one cannot with impunity continue to do the same things in the matter of diet any more than in anything else.

Fat and obese people are naturally weaker and have lesser power of resistance to disease than people of muscular build; there is, thus, an intimate relation between Life Insurance-mortality and overweight of the body from fat. Leanness and longevity, they say, go together, and "a man will only roll all the faster down the hill of life if his figure be *rotund*."

In women the difference in the rate of tissue-activities (metabolism) is due mainly to the larger proportion of fat than muscular tissue and also the amount of energy output.

It will be shown later that women during pregnancy

some people habitually constipated is explained in this way.

6. *Roughage Requirements.* It has been mentioned above that roughage is a necessary stimulant of the bowels for their daily action and that the necessary bulk could be supplied by cellulose derived from green vegetables and fruits. Fruits and greens do contain organic acids—malic, citric, tartaric and oxalic acids—whose salts have an aperient action on the bowels, while cellulose can be said to be a mechanical stimulant to peristalsis; fruits and greens act by their chemical action. Vegetable acids have one more use to the system,, *viz.*, by forming neutral carbonates they serve to preserve the alkalinity of the blood and other body fluids.

7. *Vitamin Requirements.* Although, as shown already, vitamins are essential for the prevention of certain well defined diseases, they are not a cure-all for nutritional disturbances, even though they do play an important role in all sound dietary. They have already been shown to be essential in promoting health and increasing the power of the body to resist disease.

The exact amount of vitamins necessary for optimum health is a matter difficult of calculation, but there is no doubt that an adequate amount of cereals, milk and its products, animal fats, fruits and vegetables in a diet does contain them in an *ample measure.*

Satiety Value of Foods. Man eats largely to secure the feeling of satisfaction and wellbeing resulting from eating, in fact he thinks little about the nutritive value of his food unless compelled to by disease. This feeling of satisfaction is induced and modified mainly by the length of time the food remains in the stomach.

Now, fat leaves the stomach more slowly and the emptying time is delayed by a meal containing fat and meats, and if at the end of the meal something sweet is taken the satiety value becomes still greater. This is only common experience. The physical character of the fat has an influence on the digestibility; emulsified fat of milk (butter) is easily digested, while melted fat or heated fat used in cooking is not only by itself slow to digest

calories *net per day* is considered adequate to meet the requirements of such an individual and the following supplement for muscular activity should be made to the basic-requirements.

Light work	—up to 50	calories per hour of work	
Moderate work—	„ 50 to 100	„	„ „
Hard work —	„ 100 to 200	„	„ „
Very hard work—	„ 200 and more	„	„ „

The energy requirements of other ages vary from 720 to 2160 calories in the case of children from 1 to 12 years of age; and after the 12th year the basic requirements are the same as for adults. In the case of pregnant women the requisite calories are fixed at 2400, and in the case of nursing mothers at 3000.

In the case of babies under 1 year the basic requirements are difficult to specify; but an allowance of 100 calories per kilo (=2·2 lbs.) of body weight is considered adequate.

The muscular activities characteristic of every healthy child and adolescent necessitate additions to the basic requirements. It is suggested that the activities of children of both sexes from 7 to 11 years of age be considered equivalent to *Light* work, of boys from 11 to 15 years as *Moderate* work and of girls from 11 to 15 years as *Light* work. Allowance should also be made for women engaged in household duties whether pregnant or not; these have to be reckoned as equivalent of *Light* work for 8 hours daily."

McCarrison fixes it at 2500 to 3500 calories for an Indian in prime of life according to the part of India in which he lives and the work he has to do. He also fixes the total *daily* needs of such an individual at:

Proteins	— 90—100	grammes	(3 —3½ oz.),
Fats	— 80— 90	„	(2½—3 oz.),
and Carbohydrates	—360—450	„	(10—15 oz.);

which should yield a total of the requisite number of calories mentioned above. It works as follows:

Proteins 90—100 grammes ×4
(Rubner's figure) = 360 to 400 calories;

provide the fat required as fuel food but Vitamin A as well. Vegetable fats will provide the fat but not enough of Vitamin A.

(b) The proteins of atta though better than those of most other grains are not good enough nor are there enough of them. So we must select some other food to eat with *atta* which will provide a sufficiency of "suitable protein." For this purpose we can take milk or sourmilk or curds or butter milk or cheese; or we can take meat or poultry or liver or fish or eggs.

If a man eats one pound of atta-chapathis a day, he will get all the suitable proteins he needs by taking with the chapathis plenty of green leafy vegetables and a pint and a half of milk, though he will be a stronger man if he takes 2 pints (one quart) of milk, *or* by taking green leafy vegetables and a pint of curds *or* green leafy vegetables and 4 or 5 ounces of meat *or* 2 or 3 eggs.

It is both economical and advantageous that a certain amount of the proteins added to atta should be provided from vegetable sources such as Dhals.

(c) A third defect of atta is its deficiency in Vitamin A; the best addition to make good this defect is whole milk or its products—butter or ghee; so that by taking milk and butter or ghee with the *atta* we not only provide the "suitable proteins" and fats but the Vitamin A, in which it is deficient; we, thus, make good *three* of the chief defects of the wheat. We can get the Vitamin A from other sources besides milk, butter or ghee, such as from fish, eggs, liver, kidney and green leafy vegetables. By taking green leafy vegetables and meat, or egg, or liver, or kidney, or fish, with the *atta* we make good two of its chief defects: suitable proteins and Vitamin A. Some of these animal foods—eggs, liver and fat-meat—will also make good the deficiency of fats in the atta.

(d) A fourth defect of atta is its deficiency in Vitamin C. So we must select some food or foods which are rich enough in this vitamin to make good this defect. The best foods for this purpose are green leafy vegetables or sprouted grains.

This diet is too poor in animal proteins and animal fat, too rich in carbohydrates and too high in calories. It should be adjusted as below resulting in a well-balanced diet.

	ounces.
Rice—parboiled hand-pound preferred to raw milled rice	10
Wheat, millet or cambu	5
Milk	8
Pulses—Dhal 1 ounce and Black-gram 2 oz.	3
Vegetables—non-leafy (like brinjals, gourds, beans, bendekais or lady's fingers, drum sticks)	6
Vegetables—Leafy (amaranthus and spinach)	4
Oil—gingelly oil or cocoanut oil ..	2
Fruits—mangoes (ripe), plantains ..	2
Fish, meat and eggs	3

(When milk is absent from the diet or taken in negligible quantities)

Condiments and spices in small quantities.

The above diet has been calculated to yield the following:—

Proteins	73	grms.
Fats	74	,,
Carbohydrates	408	,,
Mineral Salts of Calcium, Iron and Phosphorus—	adequate quantity.	
Vitamin A, B and C.	—do—	
Calories	2590.	

In fact all the important food elements are present in sufficient quantities even with a fair margin of safety.

It will thus be evident that if the cereal consumed is milled rice an improvement in the nutritive value of the diet and in the health of those consuming it can be brought about by wholly or partially substituting whole rice, whole wheat or one of the millets, preferably ragi.

If milled rice remains the basis of the diet it should be realised that the milled-rice eater needs more "protective foods"—milk, green vegetables, fruits, etc.—than the consumer of whole wheat or ragi. When the diet is

the child at birth and optimum nutrition during infancy. The great difficulty in arranging such a diet is to provide adequate Ca, P, Fe and Vitamin B_1, Vitamin B_2, Vitamin C and Vitamin D. Milk (whole or skimmed) is a rich source of Ca, P and of Vitamin B_2, also a good source of Vitamin B_1; milk fat is an excellent source of Vitamin A.

Eggs contain Vitamin A, Vitamin B_1, Vitamin B_2 and Vitamin D and are rich in Fe. The protein of these foods (milk and eggs) are not only themselves of the highest nutritive value but also improve the utilisation of the proteins contained in cereals and vegetables, (what we already mentioned above as "raising the biological value of other foodstuffs"). Milk has an additional advantage in the abundance and the availability of Ca Salts and Phosphates; these salts, we saw, enhance the effect of any Vitamin D derived from other articles of diet and from sunshine. Milk, although itself poor in Iron renders more effective the Iron contained in the other ingredients of diet.

Ordinary diets are usually inadequate in Vitamin D and except in sunny seasons and sunny regions a small daily ration of Cod Liver Oil is to be recommended in the dietary of the pregnant and nursing mother and in that of the growing child. Fish-liver-oils are the richest known natural sources of Vitamin A and are also important sources of Iodine; in goitrous regions, where sea-fish are not available the provision of extra Iodine in the form of Iodised salt or in some other way is recommended.

An extended dietary use of Potato is recommended to *replace* a part of the sugar and highly milled cereals in the ordinary diet. Potatoes provide extra Vitamin D and more readily available Ca and P than are present in cereals. Potato also yields more Fe and Vitamin B than milled cereals.

(The above paragraph applies to countries where potatoes are abundant, but it is of general application due account being taken of the local resources.)

6. Requirements of other adults and children. For growing children, the Commission recommends, the maintenance of a high proportion of protective foods

which go by the names of Gout and Rheumatism comes from an excess of meat in diet, and Scurvy from a lack of fresh vegetables and fruits. Liver complaints are due to an overplus of rich foods and an excess of alcoholic drinks. Excess of animal food is a fruitful cause of kidney disease. Atheroma or hardening of the arteries with consequent rise in blood pressure and tendency to apoplexy and death, common in middle aged men might be avoided for years by strict moderation in diet in respect of meats and liqour. Diabetes is yet another complaint due entirely to indulgence in rich food. There are still a number of other complaints following self-indulgence, so much so, it may be said that it is almost literally true that 'we dig our graves with our teeth.'

An old Japanese Proverb says that 'all diseases enter by the mouth;' nothing can be more true, for nearly all our illness are the result of various toxins or poisons which are introduced into the body through food, drink and smoke.

B. Under-feeding. It is astonishing how long the human body can go without food, provided a due supply of water is obtainable. Lunatics have been known to refuse food for four or five weeks at a stretch, and the experience of professional fasters shows that long periods of starvation can be borne without much evil effect, and it is only when the body weight has fallen to $\frac{1}{2}$ or $\frac{1}{3}$ of the original amount that death from *inanition* (want of nourishment) results.

In cases of acute disease the physician might flatter himself that he has been keeping his patient alive by rectal feeding, for example, but the patient is really all along "living on his own tissues." Nor need we be unduly alarmed if a well nourished patient is unable to take any diet at all for some days, as his own reserves will be able to tide him over the crisis without much harm. A non-meat-eating Hindu, who observes periodic fasts can, therefore, be said to be really feeding on his own "body meat."

Habitual underfeeding is more injurious than the opposite condition of "over-feeding". The deficit in the

well. Our greatest task is therefore, to produce and to begin to produce at once, enough of food especially of the protective food to meet the enormous demands. We should make dairy products, live-stock and vegetables our basic crops to produce protective foods.

The last War was lost, it is said, from scarcity of food, and even in the present, when shattered nations of the World will gather for Peace the above statement that "food and nutrition will not only win the War" but will also "write the Peace" may come true.

C. FAULTY NUTRITION AND EXPERIMENTAL PRODUCTION OF DISEASE

With the object of learning how far the foods eaten by the people of India are related to disease, McCarrison conducted experiments on animals fed entirely on the actual Indian dietary. He draws the following conclusions:

"The morbid states encountered in cases of improper diet included all forms of disease of the lungs, of the nose and accessory sinuses including otitis and adenoids; diseases of the eye, Gastro-intestinal diseases like cancer and ulcer of the duodenum, diseases of the urinary tracts, of the reproductive system including death of the foetus *in utero* and premature birth, diseases of the skin, of the blood, of lymphatic and other glands, of the endocrine system, of the nervous system like nervous instability and polyneuritis, diseases of the heart and general oedema. Not infrequently they were found to be suffering from more than one disease. In some cases crooked spines and distorted vertebrae were also found."

It will be seen then, from the above list that there is probably no ill flesh is heir to, which cannot be connected with faulty diet.

[Without meaning any disrespect whatever to McCarrison, this reminds one of the story of "Three men in a Boat" by Jerome K. Jerome; one of them was impelled, whenever he read an advertisement on patent medicines to the conclusion, that he was suffering from the particular disease therein dealt in its most virulent form. He,

III. Dietetic Value of Various Classes of Foodstuffs

Judged by the present criteria of adequate nutrition a knowledge of the dietetic values of the important groups of food materials will be of immense practical value.

ANIMAL FOODS

COW'S MILK

Chemical composition of cow's milk is:

Water	85·3	per cent.
Fat	5·8	,,
Proteins	3·5	,,
Lactose	4·5	,,
Inorganic salts	0·7	,,

Milk can be the sole diet of Infants for a considerable length of time and as we have seen, it supplements to diet of growing children and adults at so many points that it can well serve as a suitable foundation for all well formed diets. One quart of milk yields about 700 calories and contains one ounce of protein (casein and lactalbumen) of excellent quality from the point of view of amino-acids make-up; the proteins, besides, are kept in perfect solution by the partnership with Ca salts. The fat (butter) contained in milk is not only in a finely emulsified state and as such readily assimilable, but is associated with a large quantity of Vitamin A. Lactose (milk sugar) exerts a beneficial influence in the intestines, where by fermentative production of lactic acid it exerts a favourable influence on the acidophilic bacteria present in the bowels. (We shall come to this point again when we deal with buttermilk and Koumiss.)

Milk is rich in salts of Ca and P in the ratio particularly favourable to storage in the tissues, but it is distinctly deficient in Fe. It may be questioned, how then, the entirely milk-fed young infant is to obtain its supply of Fe; this scarcity of milk in Fe is a matter of little

necessary in adult age. None can deny that one of the greatest dietetic needs of our Country as a whole is an abundant supply of good milk. Every effort should, therefore, be made to secure for the population an adequate supply of milk of the highest quality and purity and at the cheapest rate possible; by purity we mean freedom from those frequent contaminations that are both repellant and harmful.

The good effect upon youth of the addition of milk to the diet is shown by the investigations carried out under the authority of the Medical Research Council by Dr. Corry Mann. He found that the addition of a pint of pasteurised milk to the daily diet of growing boys converted an annual gain of weight of 4 lbs. per boy into one of 7 lbs., and the average increase in height from 1·84 inches to 2·63 inches. Japanese children brought up in the farms of California with milk, butter and other dairy products are taller and more vigorous than the children of the same age living in Japan; so also the children in Bournville Garden City, near Birmingham, taller and heavier in weight than those of the same age in Birmingham City itself. These increases were proved to be due not to the small increase in the "fuel" value of the additional milk, nor to its extra protein but to the *specific qualities* of milk as food, and we have already seen how milk helps the digestion of other foodstuffs taken with it and adds to their biological value also.

Milk should be obtained from the *healthy* mammary glands of a *healthy cow*, but it is rarely so. Milk is often contaminated with the animal's excrementa, hair, dirt sweat or even purulent discharges from the udder, dust of the streets during transit of the milk and unclean matter from vessels used for milking or for delivery. It was once calculated by Dr. Backhaus that the inhabitants of Berlin consume in this way 3 cwts. of excrementitious matters *per diem*.

A great variety of acute and chronic diseases are attributed to milk; the germs of such diseases grow and multiply rapidly in milk as it affords a suitable medium for their growth. Among the most important are Surgical

in a closed vessel and holding that temp. for 30 minutes. The cream is not thereby affected in quantity; the breaking up of the cream may also be done as a part of the Pasteurisation process as the taste of the milk is thereby improved also.

Pasteurisation should be carried out with care, carelessness means disaster; because although the disease-germs contained in milk may be destroyed by Pasteurisation, the subsequent contamination of the milk should also be carefully prevented. Want of care in this respect has in many instances produced illness among consumers of even pasteurised milk.

Hence the conclusion, that pasteurisation carefully and faithfully carried out affords adequate protection against Tubercular infections, improves the flavour and taste of milk, reduces the Bacterial content to the lowest level and that little deterioration results, provided no efforts to improve the milk at the source are spared, as by careful inspection of cattle and of the procedures in milking and of transport. Proper care in this respect ensures *clean* milk, and pasteurisation when adequate ensures *safe* milk.

For ordinary purposes there is little doubt that simply boiling the milk for 20 to 25 minutes is the simplest and most satisfactory method of procedure. It is more advantageous and can be conveniently carried out in the private house. The milk is not deteriorated either in nutrition or flavour, especially if it is rapidly cooled after removal from the fire and well-stirred before use; this effects a uniform mixture of the cream (Homogenisation as the process is called).

To conclude: 1. An increased supply of milk is our urgent need for the wellbeing of the Community and should be encouraged.

2. Although clean raw milk is much better than boiled milk, it is not always above suspicion except under scrupulous care, and the best method of rendering it safe is by boiling or Pasteurisation. Each has its advantages and also disadvantages, but the latter are easily capable of recompense.

consume daily not less than about 7 to 8 pints of milk in order to obtain the necessary amount of nutriment to keep him in health,—as milk contains, in itself, as much as 85 to 90 p.c. of water. The bulkiness which its richness in water entails may, therefore, be considered a drawback to its use as a sole article of diet in most cases of illness. But there is no serious drawback, as generally patients being at rest and warm in bed require much less amount of nutrition on the whole than the healthy and the active—in fact about 3 or 4 pints of milk daily will more than suffice in any case of illness.

Concentrated foods are not well borne in severe disease and the large amount of water present in milk is, therefore, an advantage. Further the fact that milk does not require much of labour on the part of the stomach and the intestines for its digestion and absorption, and its peculiar behaviour in arresting the development of intestinal putrefaction mark milk as an *ideal food* and of special value in stomach and intestinal disorders.

The use of milk in gout has been already mentioned being non-stimulating unlike meat. The excretion of uric acid in gout is greatly diminished under a "milk-cure." In adopting a milk-cure any fanciful objection on the part of the patient may in the beginning be overcome by a little tact or improving the milk with the addition of sugar, or a "dash" of coffee which makes milk more endurable.

Milk, ordinarily in a normal individual constipates, but in some produces diarrhoea. Diarrhoea is due to the use of too rich milk and can be prevented by the addition of a little coffee to the milk.

Constipation caused by milk is usually prevented by following the milk with fresh fruits such as bananas or dried ones like figs and raisins.

There is a mistaken idea among some people that addition of common salt to milk curdles it; salt does not curdle milk, only acids or sour things do.

WHEY

When rennet (a ferment related to rennin, the milk-*clotting* ferment already referred to and is prepared from

tity is enormous and involves so much of damage to digestion and loss of nerve force, besides overloading the blood with its nitrogenous waste-products.

Meat may be unfit for food because of decomposition or disease. Meat derived from an animal showing signs of disease should not be used as food. Good meat should be red in color, firm and elastic and should not pit on pressure; the odour should be faint and sweet and not disagreeable.

Among the diseases transmitted from animals to man through eating of improperly cooked or diseased meat are Tuberculosis, Trichinosis, Tape-worms and Foot and Mouth Disease.

BLOOD AS FOOD

Although it is commonly believed that "the blood is the life" it does not mean and it is not true also that blood represents strength and energy. It is not *in itself* the food of the tissues but is merely a means of transport by which nourishment is carried from the intestines to the various organs where it is wanted; one might as well say that a spoon is of nutritive value, because it carries food from the plate to the mouth.

It is often said, figuratively of course, that blood is thicker than water. Blood infact is not much thicker than water after all and does not contain appreciable quantity of protein or other elements either, so much so that experiments conducted on animals fed on a liberal supply of blood daily showed that the animals were not able to live longer than a few weeks.

BRAIN OF ANIMALS

Consists largely of fatty material containing P; it is easily digested but is imperfectly absorbed.

The idea that animals' brain taken as food can in any way contribute towards nourishment of the brain in the human being has no foundation whatever; "Brains" cannot be had so cheap as that.

MEAT EXTRACTS

In addition to proteins and salts meat contains certain

ANIMAL FATS

Animal fats have high energy-value themselves and increase the caloric value of any diet in which they are present. They give palatibility to food and produce a sense of satisfaction. Most animal fats contain vitamins in combination, and are therefore to be preferred to vegetable fats, which are all, except the Red Palm Oil, devoid of vitamins. Butter and Cod Liver Oil are the fats, richest in Vitamin A.

POULTRY

The percentage composition of meat of poultry is approximately as follows :-

	Water	Protein	Fat	Minerals
Fowl, young	70·0	21·0	8·0	1·5
Turkey	58·0	22·0	9·0	1·5
Duck	60·0	22·0	25·0	1·0
Goose	60·0	21·0	30·0	1·5

It will be seen from the above that Duck and Goose are exceptionally rich in fat.

Eggs and poultry-meat form important articles of daily food among a large class of people in India, and poultry keeping is consequently increasing especially in places near towns. Some keep fowls for hobby, some for sport of cockfighting and some for profit. They can be reared for home use also.

Poultry are docile and easy to manage and can be looked after by women and children when the adults go out for work. It is, thus, within the scope of everybody and even a farmer with a small holding of land can keep a few fowls with advantage and extra income.

It has been calculated that a good hen when fed properly will eat about 5 annas worth of food in a month and

ral salts and vitamins, all of which are essential, we have seen, in the formation of a well-balanced diet. But it is not generally used for human consumption but only for feeding cattle and fowl. The germ is also rich in valuable food-constituents but is lost by milling.

The Protein of rice is very nutritious and is said to be superior to that of wheat. (See remarks under "Defects in Rice diet.")

The composition of rice varies considerably with the kind of rice. The following is the average composition of the kind of rice in common use in India and clearly points out the loss effected by over-milling:—(vide table on p. 227

From the above figures it is clear that parboiled home pounded rice is the most nutritious, and highly milled raw rice is the least so.

Whatever the kind of rice employed the best method of cooking rice is and should be by "steaming," as in the common practice most of the salts, proteins and carbohydrates are lost in the gruel.

The chief methods of preparing the rice, then are:

(1) Milling—The paddy is passed through a series of milling processes *without* preliminary soaking in water or steaming; in so milling a considerable part of the outer-coat including the embryo is removed; and finally the grain is polished further by machinery to give it a smooth and white glistening appearance and to improve its keeping qualities. This is the polished, white or over-milled rice, known also as the Rangoon Rice.

(2) Parboiling followed by milling or hand-pounding. After a preliminary soaking of the paddy in cold water it is steamed or boiled, it is then dried in the sun and treated mechanically by domestic hand pounding or milled, by which the husk and *part* of the outerlayers of the rice grain are removed. This rice is parboiled rice or "red" rice.

Red rice differs from Rangoon rice in that the grain has been partly sterilised by heat and that less of the outer coat and of the embryo have been removed from it, so that the grain (red rice) is richer in proteins, fats,

Fat 4·5 p.c., Fe and mineral salts in pretty good quantity and Vitamin A while green. Good malt can be prepared from cholam.

ITALIAN MILLET *(Setaria Italica) (Thennai Cholam)*

Is generally cultivated in the plains of Patna, Saran, Dinajpur etc.; considered nutritious and digestible; composition similar to that of Indian Millet.

INDIAN MILLET *(Panicum miliaceum)*
—Panivaragu, Varagu

Largely grown in many parts of India. Its composition: Protein 10·6 p.c., Starch 60·2 p.c., Fat 3·9 p.c. **Fe** Salts good quantity—no vitamins.

(Panicum miliare)—Known as Samai—is another variety and has the same composition as the Indian or Italian millets.

MAIZE *(Zea mays)*

Makke Cholam, Indian Corn—(It is called Indian Corn as it was originally obtained from Mexico, where the corn was extensively cultivated by the American Indians). It is cultivated in many parts of India and is the staple food of the peasantry in the Punjab, N. W. F. Provinces, Benares, Patna etc. Maize contains Proteins 9 to 10 p.c., Carbohydrates 60—70 p.c., Fats 4 to 5 p.c. Yellow maize is moderately rich in Vitamin A and B. It is considered not so wholesome as wheat. Maize is usually eaten fried or is ground and made into chappathis.

Cornflour is prepared from maize and refined.

OATS *(Avena sativa)*

Cultivated in some parts of India; it is an almost perfectly adjusted food so far as chemical composition and ratio of nutrients are concerned. Contains Proteins 13·5 p.c., Carbohydrates 63 p.c., Fat 7·6 p.c., minerals good quantity and Vitamin B_1. It is regarded as the most nutritious of all cereals being rich in Protein and mineral matter and peculiarly rich in fat, the only other cereal which can at all compare with oats in respect of fat being maize. The proteins of oats are "complete" proteins and therefore

bitter principles present in some varieties of the dry grains.

2. All pulse-proteins contain sulphur but less than the protein of meat. Beans are richer in sulphur than peas, while lentils contain the least of all; they also contain Ca salts as much as milk or Brown bread, Phosphorus as much as is present in whole-meal flour, and as much Fe as in yolk of egg; in other words pulses rank high in the yield of mineral constituents.

Pulses, therefore, differ from the cereals in that they contain a higher percentage of Proteins and mineral salts; some of them contain more fat, e.g., soya beans contain 25 p.c. and groundnut about 50 p.c.

3. Carbohydrates contained in pulses are abundant, but most of the pulses are poor in respect of fat with the exception of soya beans and the groundnut as noted above. Hence the pulses go well only with fatty foods.

4. Almost all the pulses do contain varying amount of Vitamin A, B_1 and B_2 but not Vitamin C; but sprouted pulses do contain lot of Vitamin C.

5. Pulses are *not readily* digested by the stomach, no doubt partly owing to their bulkiness on cooking, but if properly prepared they are absorbed in the intestines very thoroughly. Experiments have proved that the proteins of pulses are capable of thorough absorption if given in a state of fine division and are more thoroughly absorbed than gluten, the protein of white bread.

We have seen that the nutritive value of the pulses is undoubtedly high, especially is this the case regarding proteins. But supposing an active adult male undertakes to live on pulses alone, say peaflour, it would require about 22 oz. of peaflour to supply him with the necessary amount of protein required for his daily needs; but this amount of flour would hardly contain the necessary amount of carbohydrates required and would be very deficient in fat also. These deficiencies (of carbohydrate and fat) have, therefore, to be made good either by the addition of some other articles of diet or by increasing the amount of peaflower consumed. As a matter of fact it has been found that when the quantity of peaflour eaten

6. Butter beans—(Phaseolus lunatus).

* * * * *

Comparative biological value of gram-proteins:

"Bengal gram, black gram and green gram are found to be superior to lentils; green gram is much superior to lentils in other respects as well, *viz.* with regard to available protein content and the power of supporting growth. Further, green gram forms much better supplementary relations with rice than lentils. Thus the practice of giving lentil soup during convalescence of an invalid should be replaced by that of green gram."

C. ROOTS AND TUBERS

While the chief bulk of the grains of cereals should be regarded as a store house of nutriment for the young plant, the roots and tubers may be regarded in like manner as reserves of nutriment for the use of the adult plant itself; the reserve nutriment so laid up is almost entirely in the form of Carbohydrates—chiefly starch; proteins and fats are much scarce in them. Hence roots and tubers are the chief source of only one of the nutritive elements of food, *viz.* Starch; and this fact should not be lost sight of in estimating the value of this class of vegetable food. They are, however, by no means destitute of mineral ingredients, mainly salts of Potash, and the presence of these confers upon them (roots and tubers) a greater value as articles of diet than they would otherwise be entitled to possess.

All of them except beetroot and tapioca contain Vitamin A, especially Carrots and Elephant Yam. Vitamin B_1 is contained in beetroot, carrots, parsnips, potatoes, radish and ordinary yam; while Vitamin B_2 is present only in potato, sweet potato, Elephant Yams and colocasia; Vitamin C is present in almost all of them except colocasia and the yams, in which it is present only in *trace*—and in tapioca it is entirely absent; in fact no vitamins have been detected in tapioca.

The antiscorbutic value of potatoes has been known as far back as 1781, and Blane alluded to the beneficial action of the potato in scurvy among the fleet, and Dr.

CARROTS *(Daucus carota)*

Are decidedly more nutritious than turnips mainly owing to their richness in sugar (cane sugar or fruit sugar) to the extent of about 10 p.c.; the amount of protein contained is negligible but their mineral salts are of some value. They are also an admirable source of carotene from which the body can manufacture Vitamin A. Carrots are difficult of digestion and cannot be regarded as an absorbable foodstuff.

KNOLLCOLL *(Brassica oleracea-caulo-rapa)*

Contains 6 p.c. starch and only traces of Proteins and salts and Vitamin C.

BEETROOT *(Beta vulgaris)*

Contains canesugar from 10—15 p.c. sometimes; like the carrot and turnip, beetroot is almost of no food value as a source of Protein and contains a lot of indigestible cellulose; which, however, does not interfere with its digestion, as most of the Carbohydrate contained therein is in the form of sugar, which is readily absorbed into the system without previous digestion.

PARSNIPS *(Pastinaca sativa)*

Parsnips are similar to carrots and are fairly rich in starch and sugar.

ONIONS *(Allium cepa)*

Onions are chiefly valued for their pungent oil which makes them useful flavouring agents. They are, therefore, regarded as condiments rather than food. The large white Spanish Onion and the large red Goa variety are however, sweeter and less pungent, but are richer in nutrients like available Carbohydrates than the smaller variety which contains more pungent oil.

Onions are powerful carminatives and valuable in cases of constipation probably from their richness in cellulose.

The volatile oils of onions and garlic (allium sativum) which bring tears into eyes on cutting have been found to have germ killing powers which may be useful in fight-

India from Smyrna. It is credited with fattening properties if taken boiled with milk and sugar every morning and is said to stimulate the sexual appetite. Being mucilaginous when boiled with water or milk it has perhaps the power to facilitate the digestion of milk as arrowroot or barley does and minimise tissue-waste and thus of fattening the body.

D. VEGETABLES

The leaves of green vegetables are to be regarded as the lungs of the plant to which they belong and are merely the frame work on which their green coloring matter, Chlorophyll, (by which the plant feeds and breathes) is spread out. In no sense are the leaves, like the roots, store houses of nutriment to the plant. One would not expect, therefore, that such leaves would have high nutritive value, and chemical analysis entirely confirms this view.

Speaking generally it may be said that green vegetables contain:—

(1) A good deal of water.

(2) Almost no nitrogenous matter, even of what nitrogenous matter is present only about half is in the form of Protein.

(3) Practically no fat.

(4) And only a small quantity of Carbohydrate, 2 to 8 p.c. This small proportion of Carbohydrates renders their use especially as *carriers* of *fat* admissible in diabetes.

(5) Their frame work contains a good deal of cellulose, which is of no food value to man.

(6) The amount of mineral salts and Vitamin A, B_2 and C which they contain is relatively large and confers upon them much of what value they possess as foods.

Leaves are generally rich in Ca and Fe, the greener the leaves the richer they are in these food elements.

The effect of cooking on green vegetables is still further, to reduce their already poor stock of nutrients; they gain in water, in some cases by even 10 p.c.; and lose part of the Carbohydrate and protein, much of their mineral

proportion of Proteins, Carbohydrates and Iron and a large amount of Vitamin A and Vitamin C.

Lettuce is similar to celery but comparatively poorer in respect of nutrition and Vitamin A, but contains Vitamin B_1 in addition. It contains an alkaline milky fluid once used by Roman beauties to remove freckles from the face.

Parsley (Petroselinum sativum). Contains a fair proportion of Proteins, Carbohydrates and Fe and Vitamin A and C.

Rhubarb (Rheum rhaponticum). Stalks are devoid of much nutrition but contain a bitter principle, which has both a laxative and binding effect on the bowels and useful in cases of indigestion with diarrhoea. Rhubarb contains oxalates which appear in the urine as a white sediment and is, therefore, to be avoided by those suffering from gravel.

Cauliflower (Brassica oleraeca botrytes) consists of:

Water	89·43 p.c.
Proteins	3·5 p.c.
Carbohydrates	5·29 p.c.
Fat	Trace
Minerals	Small amounts
Vitamins	A, B_1 & C, small amounts.

Cauliflower is much the most easily digested and most completely absorbed also.

Artichoke (Cynara scolymus) contains about 16 p.c. carbohydrates and traces of Iron, Vitamin B_1 and Vitamin C.

GOURDS

1. *Ashgourd (Benincasa cerifera)—Kuvala—(Kalyanapusini; Pullagummidi; Chalkumra; Kushmendum* in Sanskrit)—Is mostly water, contains traces of protein and carbohydrate and of mineral salts and Vitamin B and C. It is a tonic (Rasayana) according to the Ayurveda. What chemical constituents make it so is not known, probably the mucinous principle contained it.

2. *Bitter gourd (Momordica charantia)—Karli; Pavkai, Hagalkai).* Two varieties are available in Southern

form, and this is a convenient method of preserving the fruit for future use.

Cape Gooseberries (Physalis Peruviana)—chirpotli— are both sweet and sour when ripe and made into pickles with salt or morabba with syrup.

Chinese Gooseberries (Karambola, Kamrang phal, Dharaphal, Sukapriya) (*=parrots being attracted to)*, a ridged variety of gooseberry used as condiments pickled with salt, mustard and chillies. The ripe fruits are sweet and sour and their juice has expectorant properties.

Bilimbi (Averhoea billimbi) is sour, used like tamarind, fresh or dried.

Hogplums (Sapindus emarginatus), Ambade kai—used as greens and condiments.

Mushrooms are forms of edible fungi of which there are hundreds of varieties. Poisonous mushrooms or toadstools are inedible and are great irritants of the stomach and the bowels and cause paralysis of the nervous system.

Mushrooms shrink on cooking and emit a nice flavour. They are not however easily digested in the stomach. The difficulty is probably due to the amount of cellulose which they contain. Their absorption also is very imperfect. They have no nutritional value either although they contain a fair amount of nitrogenous matter. The following are the characteristics of the edible varieties of mushrooms. Local knowledge is of course important. In edible mushrooms the tops or caps are white when young and brownish when older, the fins or plates are slightly pink and the base of the stem pure white and has no covering of any sort. Cooks usually put a silver coin in while cooking and if the coin remains bright the mushrooms are edible.

Idiosyncrasy. Even the edible varieties produce symptoms of poisoning like vomiting, urticaria etc., in some people who are peculiarly susceptible.

E. NUTS AND OILSEEDS

Nuts differ markedly from the fruits in that they are of very high nutritive value, and bulk for bulk dry nuts

fried and mixed with Jaggery in the treatment of piles, in which condition it acts as a bland laxative also.

Linseed (Linum usitatissimum) (yenkshe) contains about 38 p.c. fat, which on expression of the seeds is available as a thick bland oil. The oil is useful in the preparation of oil paints and grease and is not used for culinary purpose. Linseed meal contains 30 p.c. starch and makes a nice poultice for surgical purposes retaining its heat long and having no tendency by virtue of the contained oil to adhere to the parts over which the poultice is applied.

Linseed tea is a bland demulcent drink administered in cases of gastric irritability from any cause or of irritant poisoning. Linseed oil is a good application for burns etc.

The oil cake is a good manure for plants and good food for cattle and is said to make the butter "Soft."

Walnuts (Juglans regia) Akrot. Their approximate composition is as follows:

Protein	15·64 p.c.
Fat	64·49 p.c.; by far the highest percentage among nuts.
Carbohydrates	10·9 p.c.
Iron	4·76 p.c.

Vit. B_1 and a high Caloric value.

Pista (Pistachio nut) *Pistacia vera.* The kernel has the following composition:

Proteins	19·8 p.c.
Fats	53·51 p.c.
Carbohydrates	16·25 p.c.
Iron	13·7 p.c.

No Vitamins nor Ca salts.

* * * * *

Most nuts are eaten raw as then their vitamins are not lost and they perhaps taste better also than when baked or roasted. But their digestion is easier when cooked or roasted and absorption more complete.

Almost all the vegetable oils are devoid of carotene and Vitamin A with the exception of the Red palm oil already mentioned.

hydrates, proteins and fats contained in fruits are absorbed.

Fruits should preferably be eaten after food as desserts especially sour fruits, those containing acids.

* * * * *

From a nutritional point of view fruits may be artificially classified into 2 groups.

(1) Flavour fruits—those that contain more than 80 p.c. of water—such as apples, lemons, limes, mangoes, melons, oranges, papayas, peaches, pears, pine-apples, plums, pumelo, sapotas and tomatoes.

(2) Food fruits—all fruits having more than 20 p.c. of solids, e.g., bananas, dates, figs, prunes, raisins and bread fruit.

The only claim of the members of the Flavour fruits group to be regarded as foods is that they contain a small amount of sugar in a pleasant but rather bulky form and also the anti-scorbutic Vitamin C. They are chiefly eaten for the sake of their agreeable flavour. Their richness in water makes them more adapted to the requirements of the inhabitants of the warmer climates and if they are freely represented in the daily diet the need for the consumption of water separately will be rendered minimum.

Grapes (Vinis vinifera). These stand intermediate between the groups, for their juice contain an amount of sugar (glucose and fructose) varying from 10 to 30 p.c.

In the so-called "grape cure" from 2 to 8 lbs. of grapes are taken daily in divided quantities and between meals. If the rest of the diet is sufficient the patient may gain in body weight on this regime, while the grape juice, owing mainly to the organic acids which it contains acts as a mild laxative and diuretic and at the same time diminishes the acidity of the urine.

In the "grape-cure-treatment" as in all similar treatments much of the good that results is due to particular circumstances in which the "cure" is carried out, for example, the patient himself is made to gather the grapes and this means a certain amount of exercise to him in the fresh air and sunlight. It is chiefly in cases of so-called abdo-

pumelo and limes contain *in addition Vitamin A* also; and grape fruits contain Vitamin B_1 and C only.

The peel of all varieties of Citrus especially that of orange (sweet and bitter) and pumelo has in its outer covering minute glands containing aromatic volatile oils, by virtue of which, the peel even when fresh burns with a bright flame, emitting a fine aromatic fragrance, which has mild disinfectant and deodorant properties. Fumigation with the powdered peel drives away mosquitoes from the room for some time.

Orange peel being bitter is used in the preparation of jams and marmalades.

Mangoes are very rich in Vitamin A and Vitamin C and surpass even the apple in this respect and also in the matter of Carbohydrates and protein but not in the matter of mineral salts such as those of Ca, Fe and P.

Mangostein (Garcinia .mangostena). The pulp is sweet and has a good flavour, but the rind is very astringent. The Indian variety, known as Bhirindi, has its rind very sour and the pulp sweetish. The rind is used with condiments in the preparation of an appetising soup to be taken with rice diet.

A third variety of mangostein is exactly like the mango in shape and flavour but is very sour even when ripe. It makes a nice jam.

Palmyra Fruit. Tender fruits contain sweet edible pulp with an agreeable fine flavour, but when the fruits ripen the kernel becomes hard and indigestible. Palmyra fruit forms nice fodder for cattle and for pigs and contains no fat.

Papaya—Papaw—(Carica papaya). In addition to about 12 p.c. of Carbohydrates and traces of proteins papayas are very rich in Vitamin A and Vitamin C. The rind of wellgrown unripe papaya contains a digestive ferment—papain—allied to pepsin of the gastric juice and capable of digesting protein matter. Papaya fruit is a good laxative and is useful in cases of piles. Papaya is a useful fruit for administration even to young children.

Papaya is the most economic of the tropical fruits and is easily grown from seeds and yields fruits within 10 months from the date of the sowing of the seed. The

The raw juice is heated to the boiling point, the scum carefully removed and the boiling juice poured on a bed of activated carbon and sand contained in a conical cylinder with a perforated bottom. The activated carbon by virtue of its porous structure absorbs and removes from the cane juice a major portion of the impurities normally present in the juice, such as albuminoids, gums, colouring matter etc. The resultant juice is almost colourless and much purer than the original raw juice, and on concentration it yields an excellent jaggery—cream jaggery—possessing a very attractive white creamy colour and good keeping qualities.

Prof. Gajanan uses for the preparation of cream jaggery a tin lined brass pan for boiling the cane juice and employs milk and the mucilaginous juice of the okra plant *(Bhendi)* (Hibiscus esculentus) and he demonstrated his method at the Swadeshi Exhibition held in Calicut in January 1938 and actually produced the jaggery on the spot.

As noted already jaggery is superior to refined sugar as an article of diet as it still retains some of the Proteins, salts of Fe and vitamins of the original cane or beetroot, while they are absent in refined sugar. Moreover, constant use of refined sugar has been found by experience to be irritating to the system.

SACCHARIN

Saccharin is a synthetic chemical product and is a good sweetening agent for use in cases where sugar as such is contra-indicated as in Diabetes. But saccharin has no food value whatsoever. Sucrol (or Dulcin, meaning sweetener) is also another synthetic product allied to saccharin. Saccharin or sucrol are both bitter to the taste in concentration but when diluted with water it is very sweet and much sweeter than sugar; so much so that 2 or 3 grs. of which to a cup of tea or coffee makes the drink sweet.

Commercially saccharin is extensively used in the manufacture of sweetened aerated waters as it is much cheaper than sugar inspite of the very heavy import-duty imposed on it in India.

table origin. Presence of a large proportion of chlorides should be viewed with suspicion.

It is generally supposed that very soft water leads to development of rickets from the absence of Ca salts; this is groundless. On the other hand very soft water is apt to dissolve lead from water pipes unless there is even a trace of silica in it, while hard water containing calcium does not dissolve lead. In this way only soft waters can be said to be dangerous.

Frequent use of iced water especially with meals causes indigestion. One may, therefore, prefer water boiled and allowed to cool in clean mud pots and kept covered. This water is both safe and pleasantly cool and refreshing. The mud pot used for this purpose should well be scrubbed inside and placed on fire or in the direct sun for some time before the next fill is made, otherwise a musty odour develops inside the pot which renders the water unwholesome.

2. *Aerated Waters.* These are prepared by charging water with carbon dioxide (CO_2) gas at great pressure, so that there is violent ebullition when the bottle is opened and some of the contents of the bottle are apt to overflow during the escape of the extra gas. The effect of this escape of gas leads to loss of a considerable amount of heat, so that aerated water is always cooler to the taste than ordinary water kept under similar conditions. Hence it is unnecessary to add ice ordinarily to aerated waters, and if one prefers to have them cold the best way is to keep the bottles dipped in cold water or ice before use.

If the water is derived from springs, deep wells and Artesian wells for the purpose of preparing aerated waters it is perhaps of the highest quality.

Pure water impregnated with CO_2 is wrongly called soda water, as it does not contain any soda at all; it is therefore best to name them as carbonated waters or simply aerated waters.

3. *Spring water* is usually pure water and is generally impregnated with CO_2. Some of the springs may contain mineral salts also in addition, such as common salt, salts of soda, of potash, of magnesium, of calcium and of

ferably hot also) and this may be kept covered with a "Cosy" till required.

Tea is best infused in porcelain or enamel pot, as if done in a metallic vessel a metallic taste is imparted to the infusion on account of the action of tannin; and infusing tea a second time from the used leaf should be avoided as such an infusion contains only tannin in excess and no theine, nor the flavour of tea.

Infused tea leaves should not be thrown away but may be used for cleaning teeth or as a manure for rose and other flowering plants. A strong *decoction* of tealeaves is a good antidote in cases of poisoning by certain alkaloids such as strychnine, digitalin and antimony. Both tea and coffee are devoid of any food value except through the milk and sugar added to them to taste. The Chinaman does not strain his tea and does not add sugar or milk as we do.

The physiological effects of both tea and coffee are identical containing as they do the same active principle, theine also known as caffeine; a warm cup of tea or coffee exerts a stimulating effect on the heart and chiefly on the central nervous system, and has a tendency to ward off the sense of fatigue and to produce sleeplessness.

Tea was originally valued by the Buddhist Monks of Central Asia and Tibet as a drug enabling them to keep awake for their nightly meditation; later on it got into China about the beginning of the Christian Era and from there spread to the West. It is said that tea was first introduced into Europe at the beginning of the 17th Century by the Dutch East India Company. Tea is at present extensively cultivated in India (Assam and Darjeeling) and Ceylon and West Coast in the South.

* * * * *

The original home of the Coffee is said to be Abyssinia, where it was known about 1000 A. D. Later it was taken to Arabia (from which the botanical name, Caffea Arabica, is derived). Coffee appears to have been introduced into India by the Arab merchants about the 17th Century, and an Arab Saint named Baba Budan actually cultivated it on the hills of the Mysore territory known

layers. It is far better to allow a moderate amount of heat to act on the meat for several hours; and, the longer the time allowed the lower will be the temperature required.

Various forms of cookers are now in vogue invented with the view of economising fuel consumption and permitting a prolonged action of a moderate degree of heat in cooking. The principle of these cookers is as follows.

The simplest of them are constructed on the principle of a water bath and consist of a double pan, the outer being filled with water, which is kept at or near the boiling point, while the article to be cooked is placed in the inner vessel with a certain amount of water. The heat penetrates slowly to the inside vessel but never reaches the boiling point and all risk of scorching is thus prevented. If the steam in the outer jacket is prevented from escaping it is possible to raise the temperature of the contents of the inside vessel to the actual boiling point.

Some varieties of cookers consist of an outer cylindrical vessel lined inside with non-conducting material like asbestos and felt, and an inner metal cylinder in which the object to be cooked is placed. If it is desired to boil any food, the inner cylinder with the moistened food in it is placed in a saucepan of boiling water and boiled over fire for 5 to 10 minutes; the pan is then removed from the fire, and the inner cylinder with the food is placed inside the outer nonconducting cylinder; the lid of the outer cylinder is then closed. The escape of heat being thus prevented cooking is allowed to go on slowly for several hours. Even after 12 to 18 hours the food inside will remain steaming hot.

This latter form of cooker acts on the principle of entirely preventing the loss of heat; and just as it prevents any heat getting out, so it can with equal efficiency prevent any heat from getting in. It may therefore be used as a refrigerator to keep ice unmelted quite as well as a cooker. It saves a good deal of time, fuel and care, and there is no fear of food being scorched. These cookers are useful to travellers and campers—out or on

PART III

Disease, its Causation & Prevention

such disease usually manifests itself, simply shows that the cause had not acted long enough or with sufficient energy to produce the disease; in fact, it has been recognised that even inherited *disease*, has often its starting point in conditions quite external to the cells of the body.

Now, every individual is the offspring of two parents, from both of whom characters are inherited, and tendency to disease in one parent may either be neutralised by opposing characters in the other parent, or may be reinforced if identical peculiarities are present on both sides.

Feeble vital power without actual disease, may be the heritage of the body or part of the body; and just as certain physiological or personal peculiarities are liable to skip one or more generations—atavism, (or recession) as it is called, so also certain diseases are subject to atavism, e.g., gout and syphilis. Further, certain diseases like Haemophilia (tendency to bleed badly) and some forms of Paralysis appear generally in the male descendents only, although the females may without themselves manifesting them transmit them to their offspring.

Other diseases, which are known to "run in the family" are certain forms of functional nervous disorders like Hysteria, Chorea, Epilepsy and Insanity, which are more or less interchangeable. Cancer of the breast and the uterus generally runs in families. Gout and Tubercular diseases and some forms of eye disorders like Myopia, (especially the progressive type,) night-blindness and colour blindness are among such diseases. One nervous condition, known as Friedrich's ataxy, occurring in the young affects several children of the same family, but is not passed on from parent to child.

Regarding the mode in which disease is inherited, it is in some cases possible that the poison of disease is present in the ovum or spermatozoon (as has been proved by Pasteur in the silk-worm disease); but as to how diseases or tendency to diseases which are not due to any recognised specific poison are transmitted we know no more than how it is that features of the parents are inherited by their offspring.

Diseases, therefore, occurring in an organism or part possessed of normal vitality, must, therefore, necessarily

and they help man by enriching the soil by nitrification of manurial and animal matter, causing decay of refuse matter, souring milk, production of alcohol, and in so many other ways, such as even destruction of the pathogenic or disease-producing micro-organisms. Infact, it has been proved by scientists that man could not live on the earth except for the microbes.

There are other forms of these microbes which are neither useful nor harmful to man.

We are concerned here mostly with the disease-producing or pathogenic agents in man.

1. ANIMAL PARASITES

Of the animal parasites which affect mankind some are *External* and some *Internal*.

The *External* pathogenic animal parasites common in man are:

A. The Pediculi (lice)—*Fig 5.*
B. The Acari (itch mites)*Fig. 6.*

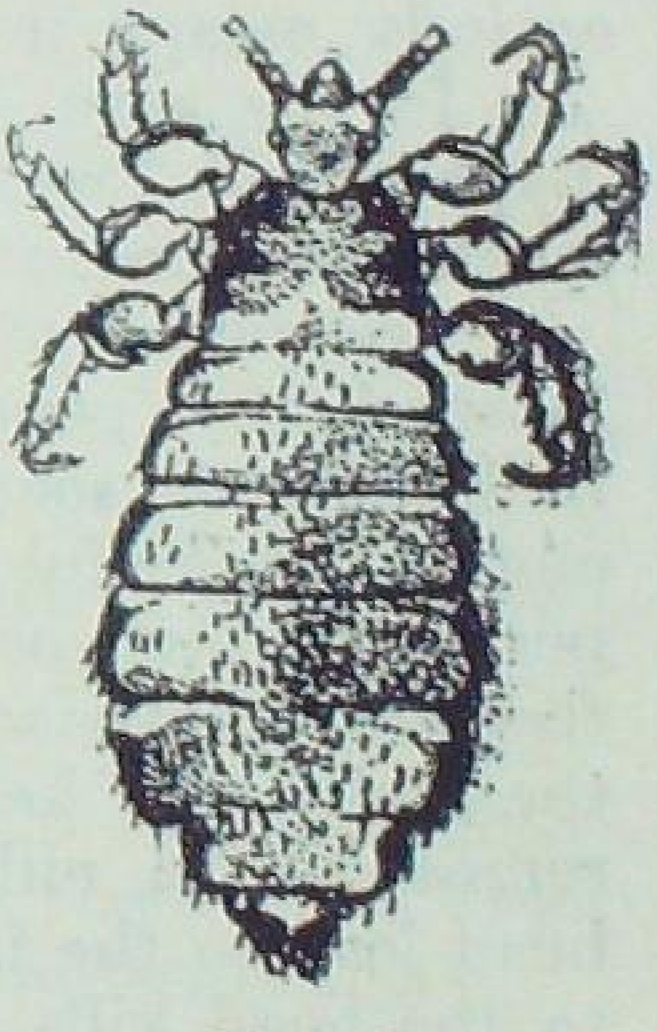


Fig. 5
Pediculus Corporis
(The body-louse)
× 20.

A. PEDICULI (Lice)

Pediculi are kinds of lice inhabiting the head, chest and the pubis. They are really insects but without wings, and obtain their nutriment by sucking blood of man through the skin by means of their probosces. Their ova (nits) can be seen sticking to the base of the hairshaft in clusters of 10 to 15 or more.

Heavy infestation by lice by itself brings about a condition known as 'pediculosis' (vagabond's disease). Pediculi produce intense itching by their digging action and give rise to superficial abscesses and enlargement of the superficial lymphatic glands.

The superficial abrasions may be infected by pus-producing organisms.

Pediculosis is a result solely of heavy infestation by lice. But lice have been known to transmit several diseases

of profound anaemia by its poisonous secretion. T. Echinococcus gives rise to certain forms of cysts (hydatids) of the liver and other viscera. The effect produced by large hydatids is only mechanical, and in the case of the liver they may not cause much inconvenience; but a much smaller growth at the base of the brain may lead to a fatal result.

B. ROUND WORMS *(Nematoda)*

These are long, slender and cylindrical, tapering at both ends. The principal parasitic forms of these in man are:

(1) *The Common Round worm (Ascaris lumbricoides)* of the intestine, generally present in children, lunatics and other individuals of dirty habits. As a rule not more than 5 or 6 worms are found in an individual; occasionally however, large numbers may be found in one individual especially in Tropical countries. The ova are oval and generally surrounded by a semi-transparent albuminous capsule; when swallowed they gradually find their way into the small intestines and develop into the mature worm in about a month's time; re-infection from swallowing the ova passed in the faeces may produce a continuous supply of these worms lasting for years.

The effects of round worms are chiefly those due to mechanical irritation giving rise to slight colic, vomiting and catarrhal dysentery and occasionally, especially in rickety children, to convulsions and other nervous disturbances. Some times these worms have been known by their wandering habits to cause obstruction, as of the bile duct causing jaundice, of the stomach, and occasionally the larynx and other places; the matting together of several worms have rarely caused intestinal obstruction and death.

In majority of cases the presence of the parasites is not suspected until after they are expelled in the faeces.

(2) *Thread worms, or maw worms (Oxyuris Vermiculares)*. These are small round worms 1|3 to ½ inch in length having the appearance of shreds of bent or twisted cotton. The ova are of a peculiar oval shape flattened like a biconvex lens. The ova cannot develop in the

this factor became evident when it was found in the West Indies and British Guiana that a year or more after treatment most of the patients might have become re-infected, yet the majority showed great improvement in health.

Extensive observations of Mhaskar in the Madras Presidency also showed a high percentage of infections of a very light degree, with an average of about 10 worms in each individual and that this was compatible with good health.

Economic efficiency and Disability. In very hot humid climates of Ceylon, East Indian and Oceanic Islands, the West Indies and Brazil hookworm infections are serious and cause much disability.

The total disability in the world due to this parasite is thus very great, but it is only in areas in which the climate is both moist and hot with a large amount of rainfall that the most serious infections are common, as the larvae do not flourish in the soil which is devoid of moisture.

(4) *Trichina Spiralis.* These are minute round worms occurring in mature form in the intestines of man and many animals, and in their immature form in their muscles. Man is infected by eating imperfectly cooked trichinosed pork (principally used in the manufacture of sausages); swine are probably infected by eating trichinosed rats or infected slaughter-house refuse. It is obvious then that no animal can become infected which is not carnivorous.

The parasite is common in America and Germany; its effects are so marked that they give rise to definite symptoms—Trichinosis—consisting generally of two stages: The first stage is characterised by acute gastro-intestinal catarrh due to presence of myriads of embryos in the intestines and is sometimes mistaken for Cholera or irritant poisoning. This is succeeded by a second stage, which develops when the embryos reach the muscles and consists of intense muscular pain, swelling, rigidity and ten-

worm itself in the tissues bursts, dies and undergoes decomposition ending in serious septic inflammation.

The female parasite is about 1|16 inch thin and 12 to 48 inches long and may be visible under the skin as a long thin wavy white band; its uterus is full of embryos, these escape from the blister in the leg of man into water, and then enter certain forms of cyclops or waterfleas, where they undergo further development; when the cyclops are swallowed with drinking water the embryos regain access to the human body. They then make their way from the stomach into the tissues and thus complete their life-cycle.

When the adult female worm reaches the surface of the tissues of the leg there may be aching pain in the affected part, sometimes there is an urticarial rash on the body in general with vomiting; a blister next forms on the skin where the anterior end of the worm is seeking to come to the surface. Those who have once suffered from the disease can usually say when the worm is nearing the surface, as they then feel a burning or itching sensation at the spot; when the blister bursts the embryos either escape through the opening, or the thin transparent uterus is itself protruded; this uterus bursts and allows the escape of a milky fluid containing numerous embryos. When the affected part is in contact with water the uterus is more completely emptied; so that to encourage the escape of the embryos cold water is usually poured over the site of the worm; when all the embryos have escaped, the worm dies and its remains become absorbed, or they may become calcified in the muscles or joints producing rheumatic pains or symptoms of joint affections. But if Bacterial infection has already set in at the blister there may be septic cellulitis with pus formation. When the worm protrudes from the opening as is commonly the case a strong thread is tied to the worm, on which the worm can be wound day by day with slight traction. This is the common method adopted even by the country folk.

Prevention against infection. Infection occurs only by drinking water containing the infected cyclops, and

In the living condition they are transparent, colourless and refract light strongly and are therefore difficult of detection or identification in their natural state. They have therefore, to be artificially stained with aniline dyes and many of them may then be identified under the microscope by their special staining reactions.

There are thousands of different kinds of bacteria, all to be distinguished by their shape, the results they produce during their growth in various culture-media like broth, agar etc. (cultural characteristics). In form bacteria may be said to follow more or less closely one of two types—the sphere and the rod. The spherical bacteria are called *cocci*; cocci in pairs are called Diplococci; Streptococci are in chains, Staphylococci are in groups like bunches of grapes; there are tetrads, where they group in fours, and sarcinae in groups of 8 or more arranged like cotton bales.

Bacilli are rodshaped (bacillus means a rod); vibrios are curved bacilli and spirilla are like rods twisted into spirals.

A temperature of 100°C or even 60°C applied for a few minutes will kill most bacteria, but the spore-bearing bacteria (like those of Tetanus, Anthrax) cannot be killed by boiling unless done for *many hours*. Very low temperature inhibits bacterial growth, but might kill them if continued long.

Bright sunlight, especially the ultra-violet rays has a destructive influence on them. Virulence of bacteria is lost sometimes readily, sometimes only after long periods of cultivation in ordinary culture media or by subjecting the microbes to growth in the presence of certain chemicals or at any unfavourable temperature.

All bacteria require for their growth a considerable amount of food material, water and an optimum temperature, usually that of the human body. Bacteria have no reproductive organs and multiply by simple fission into two (Binary fission) and thus continue the species; if there is sufficient food material and conditions of temperature, oxygen and moisture are favourable they multiply rapidly, so much so a single bacterium in 24 hours might give

(4) The susceptibility and the power of resistance on the part of the host.

The virulence of an organism signifies its capacity to produce disease by overcoming the natural defensive mechanism of the host. The virulent bacteria have the power of multiplying in the body and to produce toxic substances; e.g., the organisms of diphtheria produce highly potent toxins but do not invade extensively, while the anthrax bacillus is slightly toxic but has a greater power of invading the body.

Infection is most likely to develop when the invading organisms react on the host in large numbers and frequently, and it is for this reason that epidemics of respiratory diseases like influenza originate in thickly populated places; sometimes even a few bacilli of the most virulent type, such as Bacillus of Anthrax may be sufficient to produce a severe infection.

The route of entrance of the infective organism and the vector by which it is conveyed to the host are very important from the point of view of prevention and treatment of infective diseases. The typhoid and the dysentery group of organisms enter by the mouth and the characteristic lesions due to these organisms are found in the intestinal canal, and it has been shown that direct inoculation of these organisms into the tissues is *incapable* of producing the disease. Organisms of diphtheria usually select the mucous membrane of the fauces and the larynx as their primary sites of attack.

Susceptibility of the host exerts a marked influence on the course of the infection. It will be seen later that when disease-causing bacteria do attack the human body they produce certain chemical substances or toxins, which have a damaging effect on the tissue-cells of the body; in such cases some reaction on the part of the host is bound to develop. But so long as these chemical substances or toxins are innocuous or are helpful to the host there will be no reaction against the invading organism. It is probably rare for the bacteria to be present *initially* in such numbers or to possess so high a degree of virulence as to paralyse completely the natural defensive

not only on the abraided skin but even if artificially deposited in the subcutaneous tissue. They produce their characteristic effects only when they reach the particular part of the body, such as the gastro-intestinal tract in the case of cholera, typhoid and dysentery bacilli, and the lower reaches of the respiratory tract in the case of the pneumococcus or they should be deposited by an insect-vector directly into the circulating blood as in the subepithelial layer of the skin through even a scratch; and it is certain that a mere deposition of the hook-worm larvae on the skin is capable of producing infection of the alimentary canal.

Although as we said, the attainment of a certain location in the body is essential or is favourable for an infection such an accomplishment does not mean a successful infection, as the microbes have to encounter the various defence-forces of the host, and on the efficiency of these forces will depend the extent and outcome of the infectious process.

In this connection mention must be made of "the mysterious weapon" Herr Hitler threatened the Allies in August 1939 with, which according to him the Allies will be unable to successfully withstand. Doubt was raised if this weapon could be bacteria-bombs, bombs filled with strains of virulent bacteria like the Streptococcus and it was asked if under war-conditions of lowered resistance such as wounds, mustard-gas blisters, semi-starvation, fatigue etc., such cultures would not produce disease in the form of epidemics. "Man cannot start an epidemic even when he has the bacteria and the means of distributing them" says Dr. Rivers, at the III International Congress of Microbiology held at New York in September 1939, "and if he cared it would be a double edged sword killing him as well as the enemy." Scientists doubt also if any live-culture of bacteria can ever withstand the terrific heat of a bomb explosion.

Incubation Period. Let us assume that the invading microbe has reached and passed the portal of entry and is destined through a combination of sufficient virulence on its part and insufficient resistance on the part of the host

and vomiting which tend to expel foreign agents from the nasal, respiratory and alimentary tracts. This type of tolerance may be increased by *repeated irritation*, as in the case of calluses on the hands of labourers, or the tanning of the skin as in the sunburnt, or acclimatisation to the somewhat unfavourable conditions of the Tropics. A very definite degree of tolerance or habituation to Alcohol, Opium, Cocaine, Arsenic, Nux Vomica and such other drugs may be induced, we have seen by their repeated administration; in this connection it may be pointed out that even unicellular micro-organisms can be habituated to withstand certain concentration of chemicals that would normally destroy them. Habit is so powerful in the establishment of tolerance.

Now, conditions of tolerance to chemical agents should be contrasted with conditions of true immunity, which occur only as a reaction to external animate disease-agents, and tolerance differs from immunity fundamentally in that the properties of tolerance are not transferable by means of the blood serum from the tolerant animal to another, as is *possible* with immunity.

Immunity, then, is the general term reserved for the various and often surprising degrees of resistance to infectious diseases.

Natural Immunity. Many of the states of immunity were matters of common observation not only in civilised but uncivilised people before any use was made of the mechanism involved in such conditions. Various animal species differ markedly in their resistance to a given infectious disease, that is, each animal-species within certain limits has diseases of its own, which seldom extend to species that are very remote. It is said that the frog does not suffer from tetanus or most diseases of warm blooded animals. Again, the diseases of birds are peculiar to them and do not occur in mammals; even those characteristic of carnivora and herbivora are separable. Bubonic plague, for example, though common and easily transmissible to rats does not occur in cattle; and tuberculosis, which is common in cattle does not occur spontaneously in dogs or rats. Man as an omnivorous animal has an

cules normally present in the body fluids and tissues. When a foreign cell, such as a bacterium invades the body it soon neutralises the already existing molecule of the anti-substance with which it has specific affinity; but this under favourable circumstances stimulates the cells of the body to produce that particular anti-body in great abundance, with the result that the anti-substance comes to be present in the blood-stream in excess of the immediate requirements of the body, and in this way immunity is induced. Immunity acquired in this way is called *Active Immunity*; because, it results from the vital activity of the tissue-cells of the person or animal.

Vaccination or Preventive Inoculation aims at establishing this variety of immunity and is extensively employed to secure protection against Small-pox, Enteric fever, Cholera, Plague and Hydrophobia.

When serum of an animal which has acquired an active immunity against a certain disease is inoculated or introduced into the body of another animal, the second animal will be rendered *"immune"* to that particular disease. Immunity acquired in this manner is called *passive* immunity, because it does not depend upon the vital activity of the cells of the immunised animal. Passive immunity is more transient than active immunity, and the production of passive immunity is the aim of Serum—Therapeutics.

An anti-substance neutralises the invading agent with which it has a specific affinity by entering into chemical combination with it. Now, in Tetanus and Diphtheria the symptoms are due to absorption of the soluble toxins of the microbes; and the tissue cells secrete into the fluids around them an anti-toxin which is *"specific"* to the particular toxin. Thus, the anti-toxin of Diphtheria unites chemically with the toxin of that disease, and if produced in sufficient quantity prevents the toxin from uniting with the tissue cells and poisoning them.

In the same way the anti-toxin of Tetanus will neutralise the toxin of tetanus.

The serum of animals artificially immunised by repeated injections of the toxin of one or other of these

cular diaphragm below; so also are the organs of the abdomen and the pelvis, mostly enveloped in the peritoneum and secured to the spine behind and placed in the abdominal cavity formed partly by muscular and partly by bony structures.

In addition to affording support to their contained viscera and saving them from shocks or jars, the serous membranes are actively also concerned with combating disease-organisms through their lining of endothelial cells, which, we have seen, have the power, like the other cells of the R. E. system, of phagocytosis, and phagocytosis is the most effective means of dealing with disease-microbes.

It can, thus, be said to be established beyond doubt that all life is endued with a vital force, which enables the body to adapt itself to change of environments and ward off untoward influences, and that all tendencies of nature are towards growth and towards health, in other words, *it is as natural to be healthy as to be born.*

PHYSIOLOGICAL ADAPTATION

There is a striking contrast between the durability of our body and the transitory character of the cell elements of which it is composed, and the human organism lasts longer than if made of steel. Not only does it last but ceaselessly overcome all difficulties and dangers of the outside world. That is to say, it "accommodates" itself to the changing conditions of its surroundings; it persists in living despite physical, economic and social upheavals, and seems to "mould" itself to changing circumstances. Its organs, moreover, improvise means of meeting every new situation and its physiological processes always incline towards the longest survival of the individual. This strange function is called *adaptation* and makes human existence possible with its special characters. Hence, whatever our sufferings, our joys or the agitation of the outer world may be, our organs do not modify their rhythm to any great extent; and their tranquility which is assured by the converging efforts of the body functions is never perturbed by environmental changes.

which, though it is refunded almost atonce, soon loses its primal excellence. We see this primal excellence in many great souls (Mahatmas) who retain the qualities of youth up to a hundred years or more. Strict celibacy is the only important means of conserving vital energy.

In fact indulgence in sensual pleasures of any sort adds to the appetite for it and all one's honesty of purpose and sense of duty have not the power to check the expenditure of his mental and physical energies in the pleasure of a moment.

Exercise in moderation and up to the needs of the system is a most important and indispensable requisite; but contests in athletic sports conduce to overstrain, and many a young man has come to premature death from an excessive indulgence in those sports, while many more have permanently injured themselves.

Students at Colleges and Universities do sometimes indulge in athletic contests and unconsciously damage themselves thereby; and may have still a store of vitality sufficient to enable them to work for their Degrees. But the sum-total of these excesses made up of under-sleep, overwork, improper and untimely meals, smoking habit and other indulgences constitute the cause of their premature death; it is well said that "they dig their graves by *Degrees.*"

Physiologists maintain that the natural life of man is 100 years or even 120 years; but the fact that about 55 or 65 is now considered the full span of life indicates that the race has become so deteriorated that there is a deficit of full sixty years even in the case of those who have escaped the mortality of childhood. This deficit is the result of the various strains and excesses that abound on every side in the civilised world.

Fear and Anxiety are distinctly a strain on the nervous system and a drain on the vital forces; so also anger or rage. Instances are not rare where their effects have been so great as to produce even sudden death. One of the advantages claimed for the so-called "mind-cure" or Christian Science is that it allays fear and therefore cuts off one source of drain on the vital force.

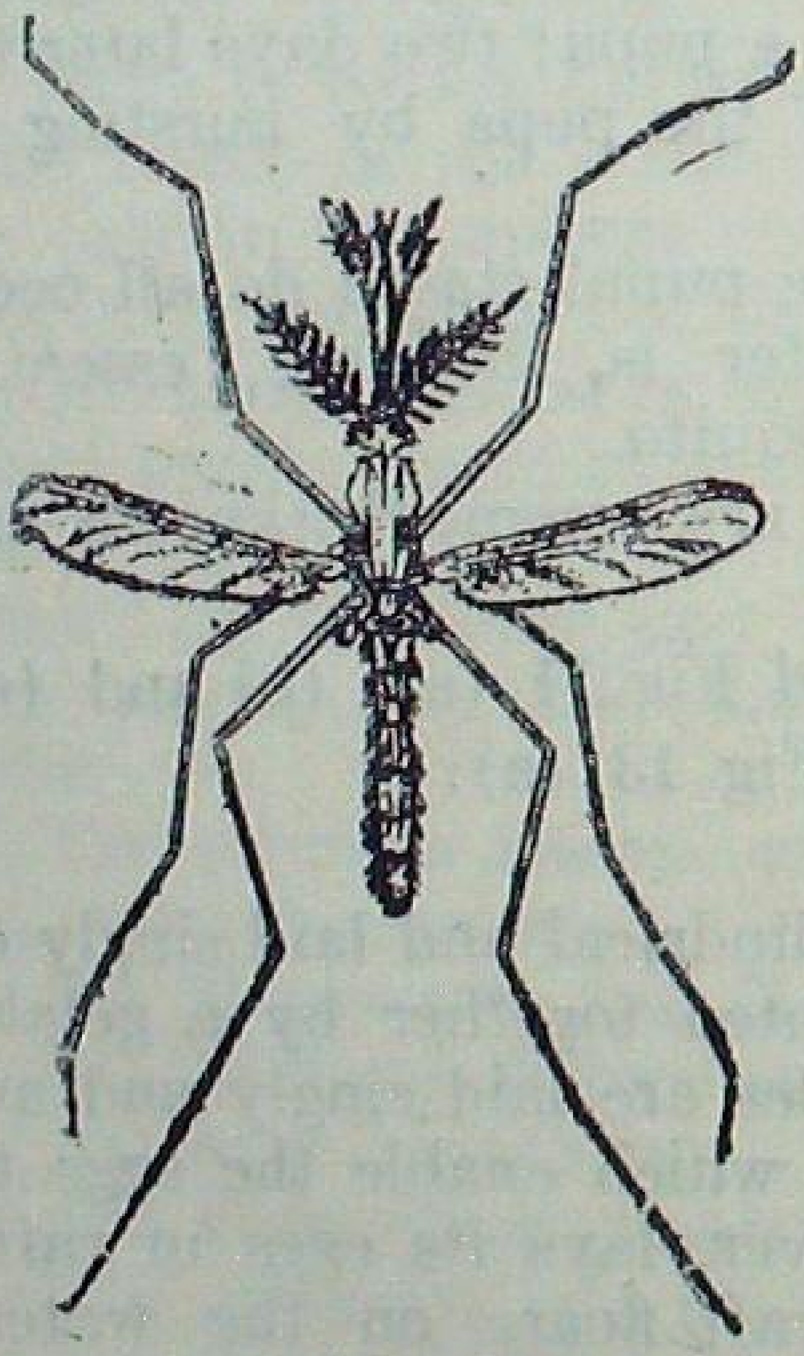
mission" as it is called, a definite period, corresponding to the time taken by the parasite to complete its life-cycle in the intermediate host must elapse before this intermediate host can infect man or susceptible animals. Ever since 1877 when Manson first demonstrated the development of Filaria in the Culex Mosquito, and Ross in 1897 showed the development of the malarial parasite within the body of the Anopheles variety before being transmitted to man, and later in 1907 Bruce recognised that the biting fly (glossina) acted as the transmitting agent in the African Trypanosomiasis (sleeping sickness of Gambia, or African lethargy) considerable attention has been paid to the study especially of the biting insects, and several diseases are now known to be definitely attributable to the activities of such insects. A knowledge of the life-history of these is, therefore, essential in regard to the hygiene of the individuals and of the community especially those resident in the Tropics, where such a knowledge enables one to adopt the proper measures of preventing disease by controlling the incriminating insect.

Insects may also cause disease in man directly by living and feeding on man as parasites. We have seen already how the pediculus (body louse) and the acarus (itchmite) cause particular skin lesions in man. There is one condition, called myiasis, which is caused by fly-maggots living parasitically in the nasal cavity of man in the tropics.

True Insects belong to the class, Insecta, and have their body divided into head, thorax and abdomen and have six legs (hence they are named Hexapoda). The head has the mouth-parts, the eyes and a pair of antennae (feelers). The eyes of insects are "compound" eyes being composed of numerous minute simple eyes closely packed together to enable the insect to have large field of vision all round without having to turn the head. The thorax is usually composed of three segments, which in many cases are fused together and the component segments are indistinguishable. Three pairs of jointed legs are attached to the thorax on its ventral side (under surface), one pair to each segment of the thorax; in addition to the legs

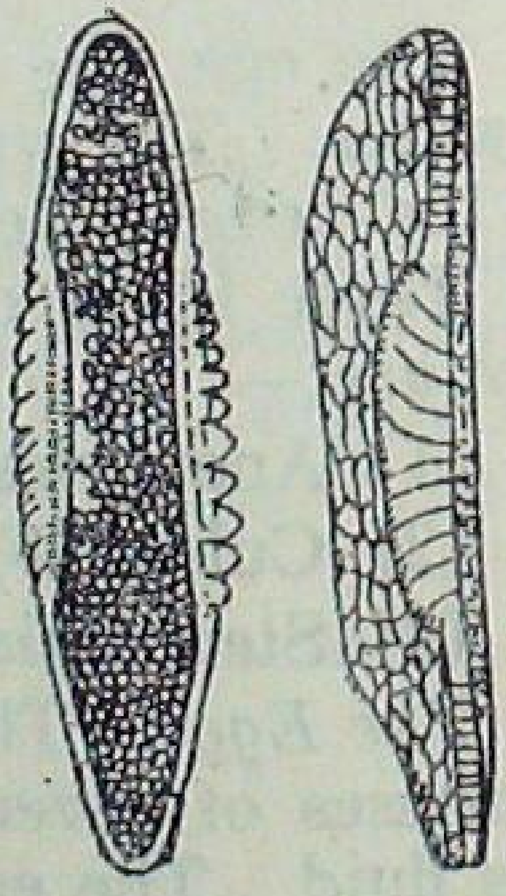
The Larva. The body of the larva is differentiated into a head, thorax and abdomen; it is devoid of legs or wings; it wriggles about actively in the water and frequently rises to the surface to take oxygen from the air through the breathing tube or siphon; when the tip of the siphon is thrust out of the water air enters the trachea. If by some means or other as by spreading kerosene oil on the surface of the water the larvae are prevented from breathing, they will die of drowning.

The anophelene larva floats *parallel* to the water-surface when it rests, and it has no breathing siphon. The culex larva has a long and thin siphon and it *hangs down at an angle* from the surface of the water. The stegomyia larva closely resembles the culex larva and can be distinguished from the latter by its short and thick siphon; it hangs almost *perpendicularly* from the water surface, while the culex larva hangs at *an angle.*



(Fig. 11)

Anopheles—male (adult)



(Fig. 11 (a)

Egg—Anopheles

mouth-parts are adapted for sucking *fluid* food but they cannot bite. The sucking proboscis is usually folded up under the head and it is recognisable only when the fly ex-serts the proboscis in attempting to feed. The tip of the proboscis has a pair of large flaps, which enable the fly to have a larger feeding surface and easy suction of food. The head has a pair of large and very conspicuous compound eyes. The thorax has a pair of large membranous transparent wings starting at the middle and a pair of minute knoblike structures known as "halters" or ba-

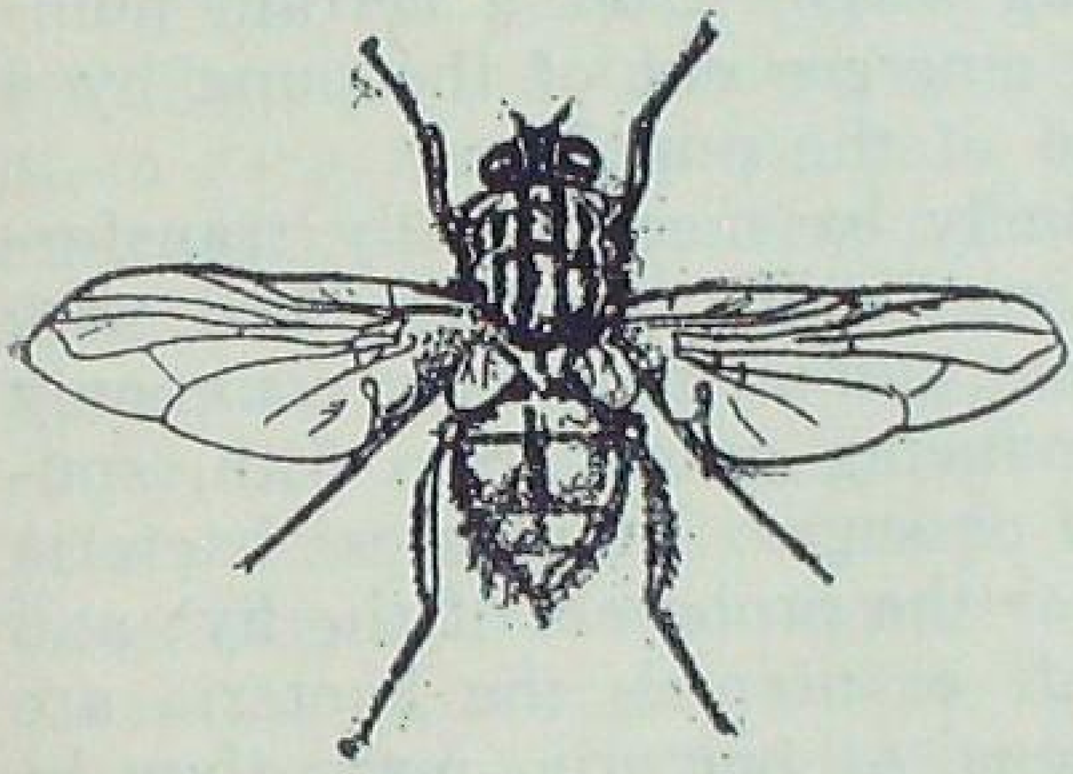


Fig. 15
The Common Housefly
× 20

Fig 15 (a)
The Housefly in the act of regurgitating liquid food
(After Hewitt.)

lancers, which represent the vestigial hind pair and are usually under cover of the base of the wings. The abdomen consists of several segments usually four in number.

Common flies breed in decaying animal and vegetable matter. The eggs are laid on the moist decomposing organic matter, such as cowdung heaps, horse manure, pig manure, human excrement, decaying grain and hay, excreta soiled straw, paper and rags, decaying kitchen-refuse, rotting fruits and vegetables; they are small elongated and cylindrical, white or yellowish-white in colour and usually found in masses, the individual eggs sticking together by the gummy secretion on them when freshly laid.

A single female house-fly lays from 100 to 150 eggs in a single batch, and such egg-laying may happen about 4 times during the entire life-time of the fly. When the

Certain flies deposit their eggs on a foul-smelling open sore and cause great trouble. This condition is known as myiasis. It is said that Yaws in the Tropics spreads in this manner.

Now in order that a particular species of flies may play an important role in the transmission of intestinal diseases they must habitually resort to human excrement and food in the kitchen and dining room. The common house-fly is abundant both in the dining rooms and in privy vaults and is therefore the one species of real danger. It should not really therefore, be a "house-fly" if we took proper precautions. It will always be a "filth-fly" and that would be a much better name for it, and Howard rightly calls it Typhoid fly.

The most effective of all means of controlling flies are: (1) to prevent the exposure of any decaying vegetable and animal matter, such as cowdung, horse litter, street and domestic refuse, night soil and carcases in which flies breed; such refuse should be buried or incinerated to prevent flybreeding. Manure and refuse if kept loosely stacked is a very favourable breeding ground for flies. If on the other hand they are thrown out into a pit and thickly packed and then tightly covered over with mud the heat produced by the decomposition is sufficient to kill maggots of flies that may be breeding in them.

A highly ingenious method of handling manure, which is particularly useful on a farm is based on the fact that the fly larva cannot pupate in moist manure but must find its way downward into the drier soil below. The manure is stored on a slatted platform standing over a shallow concrete basin containing 2 or 3 inches of water. Each day the stable cleanings are placed on the platform completely heaped and well moistened. Flies lay their eggs in the manure, the larvae develop and when ready to pupate they migrate to the drier ground around and drop down into the water and are drowned. In the Kudlu cocoanut farm we saw one April morning as many as 300 larvae of flies killed in this manner.

Proper control of stable manure will go far to lessen the number of flies in a locality, but if stable manure is

G. COCKROACHES (Fig. 20)

These have not been proved to convey any disease except perhaps mechanically being filthy; their presence in a house is a sign of carelessness in sanitary cleanliness. They are often a nuisance in kitchens and places. Cleanliness and use of powdered borax are very effective in driving them away.

A useful insect powder for use against cockroaches is 3 parts of sodium fluoride mixed with one part of powdered pyrethrum. This powder should be scattered about at night in the kitchen and other haunts of the cockroach and swept up next morning. The sodium fluoride is the important ingredient as it acts as a poison to the pest. Powdered borax is also useful. What we should do is to persuade the cockroach to eat the borax, and the best way to do this is to mix the borax with fine sugar or powdered chocolate. Borax can also be mixed with treacle and the mixture spread on pieces of tin or cardboard. The important point is to mix the borax with any attractive and leave the mixture lying about in the cockroaches' frequent haunts.

D.D.T. THE LATEST INSECTICIDE

In recent months the Press has given much publicity to the newly discovered Chemical substance known by the letters D.D.T. (De De Tane). Its undoubtedly great value in many spheres of insect control has caused its development to be ranked in importance with the discovery of penicillin.

Its vital war-time use is for dusting or impregnating clothing to destroy the lice which carry typhus and to spray on to the breeding places of malaria-carrying mosquitoes. In those directions its success has been spectacular as shown by the dramatic checking of the typhus epidemic in Naples through the mass disinfestation of the civilian population in January 1944, and figures of louse infestation among the armed forces. One of its earliest successes was in Switzerland in controlling a plague of the Colorado beetle, the notorious pest of potatoes.

proportion of proteins, carbohydrates and fat. Agar in combination with mineral oil—Petrolagar, agarol etc.—are recommended. Strong purgatives are not advised. Castor oil, which is a favourite with many of our people has now been replaced by the agar and mineral oil combinations mentioned above. Cascara (Aromatic or Elixir) and senna are also good. Many a time combined with constipation there may be hyper-acidity of the stomach, which condition is best treated with Milk of Magnesia taken in small amounts after each meal.

Deposition of pigment is one of the most constant phenomena and is more pronounced in people of darker complexion. We have mentioned that the nipple becomes darkened and that the areola becomes larger and of deeper colour. Intense pigmentation of the skin over the labia majora (two vertical folds one on either side of the entrance into the vagina) and adjacent parts of the vulva is commonly observed; a thin line of brownish discolouration extends vertically along the abdomen in the midline.

Often copper-coloured patches of discolouration (chloasma) are seen in the neck and the face. Itching of the skin especially of the breasts and the abdominal wall is common due to stretching of the skin from distension or dropsy. Itching of the vulva and the perineum near the anus is often present and is due to the presence of dropsy of the parts from congestion of pregnancy. A concentrated urine or a urine containing sugar often causes severe itching of the parts known as "pruritus".

During pregnancy the nervous system is not free from the functional disorders which may be present ordinarily in a person before the advent of pregnancy; but the personal habits and reactions of almost every person are altered to some extent, and hysterical states are then common enough.

Hysterical conditions, it must be remembered, are often feigned by clever women with the object of inducing the medical attendant to remove the presumably offending cause.

Caprices of appetite, vascillation of tastes in general

stantly and early in pregnancy is, we have seen, the enlargement of the Montgomery's tubercles and a gradual deepening in colour of the pigment contained within the areola and a widening of the areola itself (secondary areola). Preparation for the secretion of milk is made by Nature long before delivery, and from the III month onwards it is usually possible to squeeze out a drop of clear mucoid fluid, which in the last 3 or 4 months of pregnancy contains numerous colostrum corpuscles.

(3) *The Abdomen.* The symmetrical and progressive enlargement of the abdomen can be observed even from the middle of the IV month to the end of the IX, and during the X month the level of the fundus of the uterus is the same as in the VIII month. There is commonly a well-marked brownish line running from the umbilicus to the symphisis pubes and increased pigmentation in the neighbourhood of the groins; so also striae gravidarum; very often especially during the last 3 or 4 months of pregnancy the movements of the foetus could be seen.

Palpation (feeling with the hand) reveals a medially situated enlarged uterus, its height corresponding to the period of pregnancy. Its contents are more or less fluid, but from the IV month onwards the foetus can be felt and its movements. The enlarged uterus is constantly felt to contract, but the contractions until the onset of actual labour pains are not painful. Auscultation (listening) with the stethoscope reveals the foetal heart-sounds, which can be heard from as early as the V month.

In the period of pregnancy from the beginning of the IV to the end of the V month the presence of a movable solid body in fluid contained inside the uterine cavity can be determined by movement of the fingers known as "bàllottement" (meaning tossing like a ball). This is a positive sign of pregnancy.

2. THE HYGIENE OF PREGNANCY

Although pregnancy is, as we said, a normal function and while many a pregnant woman may derive benefit from some harmonious relationship between herself and the unborn babe it may be said that pregnancy is also a

than lay down some general rules. Clothing should be warm enough to guard against chills, sufficiently loose to allow free movements of the limbs and free breathing and should not tightly compress the abdomen or breasts. If corsets have been worn they need not be let off, but should be so chosen as not to compress but rather support the abdomen and the breasts from below.

In most cases and in all cases where the abdomen is pendulous (hanging forwards) the use of a well-fitting abdominal belt so adjusted as to support the abdomen from below is advisable. Garters must not be worn as they increase the tendency to venous congestion of the legs and dropsy.

Shoes should be comfortable and large enough to allow for the slight dropsy of the ankles and feet which may accompany pregnancy in the later months. They should be reasonably broad, for the centre of gravity undergoes a partial but decisive change throughout pregnancy. Falls are common accidents in pregnancy and are most dangerous and should be avoided. The heel should be broad, of the usual height to which the woman is accustomed. A high heel compels the patient to hyper-extend the back which is already so displaced in an effort to maintain the equilibrium.

MARITAL INTERCOURSE

It is not usual to abstain from sexual intercourse during pregnancy although in this respect the lower animals set an example to man. Coitus should certainly be avoided after the 6th month, for there is reason to believe that thereby dangerous virulent organisms that might cause puerperal sepsis may be introduced into the vagina. Coitus should be especially avoided in cases of habitual abortion.

3. MENTAL HYGIENE OF THE PREGNANT WOMAN

"Too many babies," says Webb-Johnson, "start life handicapped unfairly because their mothers have been unfair to themselves during the period of pregnancy." It is fortunate that of late prenatal clinics have come into existence, where expectant mothers are given instructions

the fear for instance of labour—sap the expectant mother's strength and energy and make the outlook bad for both the mother and the child in the womb.

It is perhaps hardly necessary to add that the mother should lead a life free from all excesses; smoking too much and partaking too frequently of alcoholic liqours are to be avoided. Some children are born with an alcoholic taint, because of the indulgences in them by the mother during pregnancy.

It is most important too that the expectant mother should attend to her diet properly, avoiding over-feeding and also eating the wrong kind of food.

4. PREPARATION FOR LABOUR

While an increasing number of our obstetrical patients especially in the Cities are receiving care in hospitals and maternity homes the majority are still confined in their homes particularly in the rural districts. This will probably be true for some time to come. While the facilities available in the private home in regard to equipment, assistance etc., are hardly comparable to those of well-managed institutions, at the same time it is quite possible to so arrange matters in the average home that a normal patient may receive reasonably good care.

In Cities where there are prenatal Clinics the visiting nurses usually issue clear instructions especially to the primiparae in regard to the signs and symptoms by which the onset of labour may be recognised, such as continuous pains, the possible appearance of a "show," or signs of rupture of the membranes etc., so that the patient may send for her midwife at once and in time.

It is certainly most advantageous to procure and get ready the services of a well trained midwife sometime in advance of the expected confinement, who will inspect the quarters to be occupied by the patient in order that the surroundings may be properly arranged. And it should be the midwife's duty to see that articles like clean basins, bed-pan, douche-can etc., are on hand and a proper supply of necessary antiseptics and sterile dressings are ready in the house and drugs.

world, where these animals are most plentiful. Goat's milk has the advantage that the goat does not suffer from Tuberculosis; when fresh it is excellent, and although it is believed that babies fed on goat's milk do sometimes develop a form of anaemia there is no foundation for such a belief.

Buffalo's milk is unsuited for infant feeding as its casein, however modified, is said to be hard of digestion by the infant's stomach.

Most of the difficulties of infant-feeding can be attributed to the fact that the young digestive apparatus must handle relatively large quantity of food as compared with that in the adult; this necessitates considerable attention to the physical form in which the food is given, and since the infant has no means of masticating food either liquids or soft solids must be used.

In the light of the present knowledge we may say that an infant's diet should meet the following requirements:

(1) It should contain proteins of such quality and in sufficient quantity as to meet the requirements of growth and repair.

(2) It should contain enough Carbohydrates and fat to supply the energy-requirements not met by proteins.

(3) It should contain all the Vitamins (Vitamin A, B, C and D) in sufficient quantities.

(4) It should contain mineral salts, especially of Ca, P, Iron and Iodine—in adequate quantities.

(5) It should provide sufficient calories for heat and energy-production.

(6) It should contain sufficient amount of water for free action of the skin, kidneys and the bowels.

(7) Most important of all, the food should be free from harmful bacteria and injurious substances.

These seven requirements are laid down as the standard by which a diet for an Infant ought to be prescribed.

Food Materials. Now, breast-milk is the simplest and the best way to meet the above requirements when it is available. But if artificial feeding is to be resorted to, cow's milk immediately suggests itself as an inexpensive, abundant and well-adapted source of the infant's diet. It

at the 5th month he will require about 28 grammes of Protein per day (24 hours). This amount can be supplied from 40 ounces (5 feeds, 8 ounces each) of the 2 to 1 Standard mixture of milk (containing pure milk, $\frac{40\times2}{3}=$ 25 ounces) containing 25 grms. of protein and one ounce of the Wheat and Ragi mixture containing, as we saw, about 3·30 Grms. of protein.

In preparing the feed with this food-powder mix the food-powder first to a paste with cold water, pour into boiling water on a gentle fire and stir until the gruel is uniform and thick. Next, add fresh cow's milk in sufficient quantity (2 to 4 ounces) and let the whole simmer for 2 or 3 minutes more. Remove from the fire, cool and administer.

Note: For every 8 ounces of the feed are required 2 level Teaspoonfuls of the food-powder, 2 ounces of milk and about six ounces of water.

Now the size of each feed at the 5th month is about 8 ounces, at the 6th month it would be about 9 ounces and so on. The food-powder and the amount of milk can be gradually increased as the child grows.

At one year the baby is about 20 lbs. and will require about 35 Grms. of protein per day which can be supplied from 30 ounces of pure cow's milk (containing 30 grms. protein) and one and a half ounces of the Wheat and Ragi mixture containing 5 grms. protein. At the age of 5 months the cereal is given only once daily, but at the age of 12 months it can be given twice daily and the milk could be given whole and undiluted.

When the baby is weaned the total quantity of cow's milk given need not exceed 30 ounces per day.

The usual supplement of Cod Liver Oil and fresh fruit juice should not however be omitted, as these supply Vitamin A and D and a certain amount of pure animal fat.

Ordinarily on a pure milk diet or milk diet thickened with cereals the baby's bowels are apt to be constipated. In the case of whole cereals like Wheat and Ragi ground down in their entirety their husk acts as a mild laxative.

culty in growing up. They remain childish in their reactions, and later in life are both dependent and demanding. They make poor husbands or dissatisfied wives, and in general as they grow older they find adaptation increasingly difficult. This does not mean that children cannot love their parents, nor parents show affection for the children, but it is important that parents not fondle their children too much, which unfortunately they commonly do. This is particularly apt to occur if the parents are not well-adjusted to one another and idealise their affections in their children.

Children must be taught good sportsmanship; if necessary the parents must learn it themselves. They must be taught to love and respect other people, to be tolerant and to look for another's good points rather than bad traits.

They must be taught to work. The younger generation is growing up with very little practical experience in working, with the result that when they are thrown out on their resources they not only have no knowledge of how to work, but are unreasonably afraid of failure.

Parents who play with their children have much more influence over them than those who do not. Children should under no circumstances be relegated to "ayahs" or governesses; and supposing that relegation is necessary parents should give them as much of their time as they possibly can both for their own sake and for the sake of the children.

Parents should keep in constant touch with their children's teachers, as these are able to see qualities in the children which parents are perhaps not familiar with. By familiarising with the work of the child in school the parents will stimulate the child's interests, broaden their own point of view and be able to make suggestions to the teacher which will be of great value towards the child's training.

Parents should secure their children company and association of as many playmates as possible and try to

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